British Columbia Mineral Exploration Review 2002

BRITISH COLUMBIA

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Photo captions:

1. *Looking southerly over Kemess North deposit.*
2. *Coloured roofing granules, Ashcroft basalt quarry.*
3. *Coalbed Methane testhole in southern BC.*
4. *Kena property, south of Nelson, BC.*
5. *Looking southwesterly over Eskay Creek mine.*

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BRITISH COLUMBIA
2002 MINERAL EXPLORATION REVIEW

Ministry of Energy and Mines - Resource Development Division
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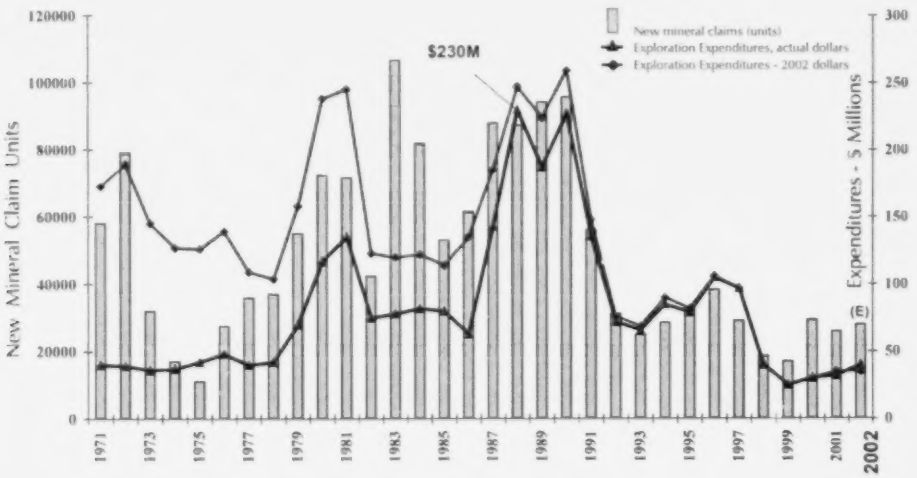
INTRODUCTION

The mineral industry continued to face difficult challenges in 2002, primarily as a result of the difficulty in financing projects and depressed metal prices. Gold was a real bright spot, as the price rose to and stabilized in the US$310 - 320s range, and rose to over $350 at years end. British Columbia mineral exploration expenditures increased for the fourth consecutive year and are estimated to be about $40million.

Both the *Mining Exploration Tax Credit Program* and *Exploration Investment Tax Credit* for flow-through investors helped attract investment in the province. Coal exploration expenditures were down significantly from 2001; however, more coal licences were issued. There was continued strong interest in coalbed methane. Industrial minerals production increased with new processing capability, while exploration spending decreased. Trends were towards increased export of aggregate and value-added processing of raw materials.

Mining continued to play a strong economic role with 13 metal and coal mines, 40 industrial mineral quarries and mines, and more than 1000 aggregate pits. The total value of mineral production for British Columbia was down 6% from 2001, reflecting generally lower commodity prices and several mine closures. The coal and most of the industrial mineral operations have substantial resources; however, most of the metal mines have less than 10 years of ore reserves.

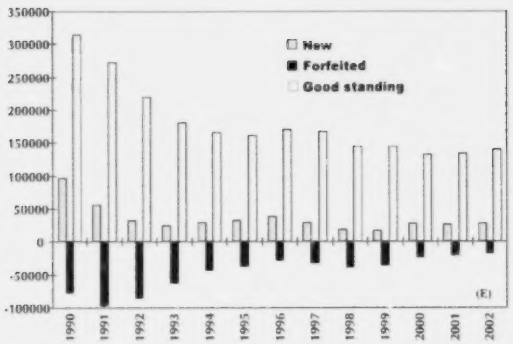
Figure 1...



Mineral exploration (fieldwork) expenditures and number of new mineral claims recorded in British Columbia: 1971 to 2002

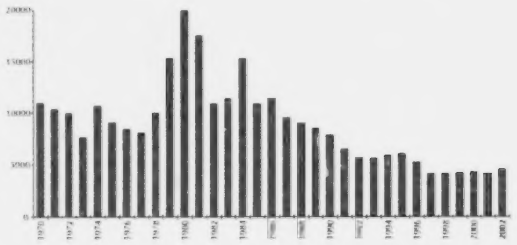
As in past years, information obtained in this review, including tonnages and grades, are from data released by the individual owners or operators. The Ministry of Energy and Mines makes every effort to accurately report this information, however, the Ministry is not responsible for errors or omissions. Monetary figures are in Canadian dollars. All information should be checked and verified before use.

Figure 2 ...



Mineral units (new, forfeited, good standing); 1990 - 2002

Figure 3 ...



Free Miner Certificates: 1970 to 2002

The more advanced projects included several copper porphyry deposits that were examined because they have significant gold and/or platinum group elements values.

Northgate Exploration Ltd carried out the largest exploration program in British Columbia with additional drilling on the **Kemess North** copper-gold deposit. A large drilling program at **Afton** by DRC Resources Inc continued to trace mineralization to the southwest of the pit area. After completing an in-fill drilling program on its **Morrison** porphyry copper-gold deposit in the Babine region, Pacific Booker Minerals Inc has outlined a new resource and plans to conduct a feasibility study.

The **Kena** intrusion-related gold project near Nelson continued to attract considerable attention. During the late summer Kinross Gold Corporation entered into an option agreement with Sultan Minerals Inc to explore the northern portion of the property, including deep drilling in the Gold Mountain zone.

In mid-December, Redfern Resources Ltd received a Project Approval Certificate for its **Tulsequah Chief** deposit, located southwest of Atlin.

In-fill and geotechnical drilling on the Southeast zone of the **Sustut copper** project was successful; a feasibility study is in progress.

International Wayside Gold Mines Ltd continued to drill the **Cariboo Gold Quartz** property in the Wells-Barkerville camp, focusing on both vein and pyrite replacement-style mineralization near the Bonanza Ledge zone and on the adjoining Myrtle property.

Leader Mining International Inc continued a feasibility study on its **Cogburn** magnesium metal project near Hope.

STATISTICS

Estimated expenditures on exploration fieldwork in British Columbia are $40 million for 2002, up 25% from 2001. There were 75 exploration projects with budgets in excess of $100 000, up from 57 in 2001. The number of mineral claim units recorded in 2002 is forecast at 28 000, an increase of 6% for the previous year (Figure 1). The number of forfeited units in 2002 is forecast at 17 500, compared to about 20 400 in 2001 (Figure 2). This is the fourth year in a row there has been a decrease, another indication that there is growing interest in the province's mineral resources. The number of Free Miner Certificates issued in 2002 (Figure 3) is forecast to increase 7% to 4375 from 2001. Drilling in British Columbia, is estimated to total 215 000 metres for over 90 projects. The drilling was split with approximately 160 500 metres for metals, 44 000 metres for coal (down significantly from 2001 and 10 500 metres for industrial minerals.

During 2002, approximately 14% of exploration spending was around mine sites, a dramatic drop from the previous year's figures. An estimated 68% of exploration expenditures were on advanced projects and 18% on grassroots programs (Figure 4). The largest exploration programs were at the **Eskay Creek** and **Kemess mines.**

MINING HIGHLIGHTS

The value of solid mineral production for the year is estimated at $2.84 billion, representing a decrease of 5% from 2001 (Figures 5 and 6). The locations of the six metal, seven coal, nineteen (of ~ 40) industrial minerals mines and one tailings project that were in operation in 2002 are indicated on Figure 7 (*see also* Table 1). The mines employed a workforce of about 7000 during 2002. Final production figures for operating mines will be included in the forthcoming annual publication *Exploration and Mining in British Columbia - 2002*.

Highlights of metal mining operations included continued important gold and silver production at **Eskay Creek**, significant productivity improvements at the **Kemess South** mine in the Toodoggone district, and production plans to 2009 confirmed at **Highland Valley**

Copper. The **Myra Falls** mine re-opened in late March and increased gold and silver production while reducing operating costs. Estimated mine production and reserves/resources for 2002 are listed in Table 1.

Copper represents 21.2% of total solid minerals production value, projected at $602.5 million, down about 11% from 2001. Production was down by approximately 10%; principally as a result of lower production at **Myra Falls**.

Gold production is forecast to be 20.8 million grams (668 730 oz), down 14% from 2001, and valued at about $319 million. Increases in production are forecast at **Eskay Creek**, **Kemess South** and **Myra Falls**. **Eskay Creek** is the largest producer, with 11 400 kilograms (366 000 oz).

Silver output is estimated to be 646 million grams (20.8 million oz), up 7% from 2001, and valued at about $151 million. This is primarily due to an estimated increase at **Eskay Creek** to 498 000 kilograms (16 million oz), representing a 17% increase from 2001. **Myra Falls** is also forecast to increase silver output.

Zinc production is estimated to be 55 million kilograms worth $67.6 million, and lead output is estimated at 2.6 million kilograms valued at $1.8 million. These are 50% and 93% decreases in production for zinc and lead respectively, due primarily to the closure of the **Sullivan** mine and slightly lower production from **Myra Falls**.

Molybdenum production is estimated to be 7.4 million kilograms, valued at $82.9 million. The 7% increase in value, driven by higher prices, was reflected from **Endako**, **Highland Valley Copper** and **Huckleberry**.

The forecast value of structural materials, at approximately $482 million, is up about 2% over last year; while that for industrial minerals is up about 10% to approximately $46 million. The new **Ashcroft** quarry and roofing-granule plant approached design capacity in 2002. There are approximately 1100 construction aggregate operations in the province.

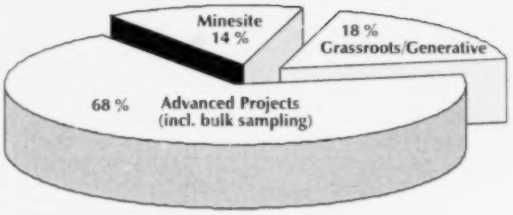
Clean coal production in 2002 is expected to total about 25.3 million tonnes, with a forecast value of approximately $1.07 billion, representing 37.7% of the total solid mineral production (versus 35% in 2001). The reported value is at the mine gate and does not include rail and port costs, which the customer pays.

METALS

OPERATIONS

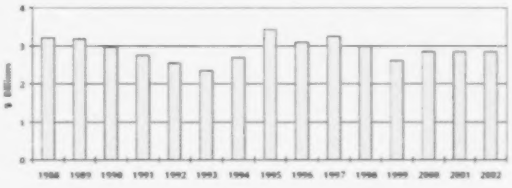
The **Eskay Creek** massive sulphide, underground mine, owned and operated by Barrick Gold Corporation, is the fifth largest silver producer in the world and among the richest in terms of value per tonne of ore. In 2002 the mine achieved a total production of 62 200 kilograms (1 million oz) of gold and 3110 tonnes (100 million oz) of silver since opening in 1995. The total operating cash cost during 2002 was forecast by the company to be US$51

Figure 4 ...



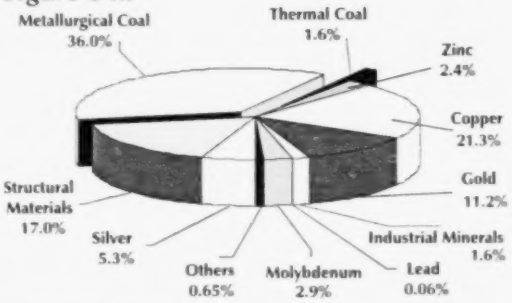
Exploration expenditures 2002; by level or category of program

Figure 5 ...



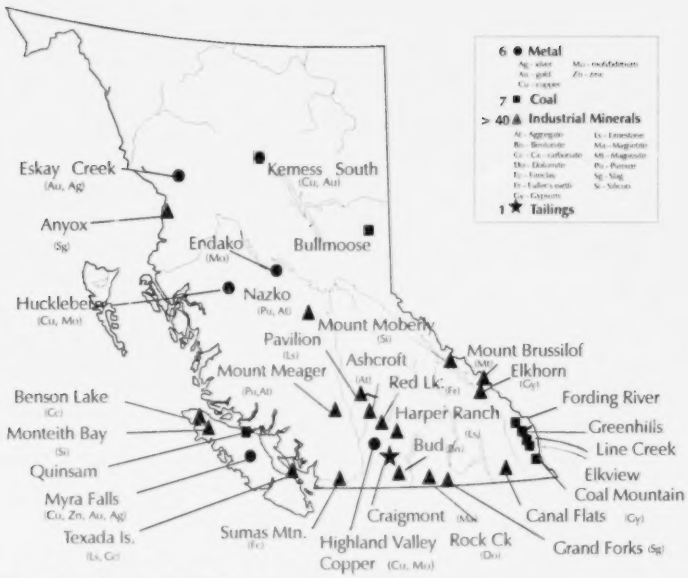
Solid mineral production value in British Columbia: 1988 to 2002

Figure 6 ...



Forecast value of solid mineral production in British Columbia; by percentage of total value - 2002

Figure 7 ...



Operating Mines in British Columbia - 2002

per ounce of gold, net of silver co-product. Higher production this year reflects a decision by Barrick to ease blending constraints on the direct shipping ore and increase milling capacity to average rate of 640 tonnes per day. Direct shipping ore, expected to increase to 340 tonnes per day, contains about 62% of the gold and 66% of the silver. Production for 2002 is estimated at 123 350 tonnes of direct shipping ore grading 69.94 g/t (2.04 oz/ton) Au and 3203 g/t (93.43 oz/ton) Ag.

Production from Eskay's gravity and flotation mill is forecast at 3170 kilograms (102 000 oz) of gold and 124 400 kilograms (4 million oz) of silver from 110 000 tonnes of ore. Approximately 60% of the precious metals are recovered in the gravity circuit and 40% by flotation. The mine employs approximately 320 persons. The end of the mine life is estimated at mid-2008. The total past production, reserves and resources at Eskay Creek are equivalent in value to about 7.3 million ounces of gold; at current prices the total in-situ value of the Eskay Creek orebodies is estimated to be around $2 billion.

Exploration efforts in 2002 followed up on some high-grade intercepts, in the down-dip extensions of the NEX and Hangingwall zones, at the north end of Eskay Creek orebodies, cut by drilling in the fourth quarter of 2001. Surface and underground diamond drilling, totaling approximately 34 000 metres, resulted in the discovery of additional mineralization in the 44, Deep Adrian Rhyolite, Water Tower (21C) and 22 zones.

At the **Kemess South** porphyry gold-copper mine, Northgate Exploration Limited continued to improve mining, milling and transportation operations during 2002. The operating cash cost for the year was estimated by the company to be US $176 per ounce of gold, net of copper credits. The mine employs about 385 workers. The daily milling rate is approximately 48 000 tonnes; third quarter results averaged a record 50 300 tpd and 91% mill availability. Three major advances were made at the mine during 2002: a new mine haulage truck and electric cable shovel were added to the open pit operation; a new tailings cyclone plant, designed to produce a clean sand fraction for use in the ongoing construction of the tailings dam, was completed; and two new column flotation cells were installed in the mill, which are expected to result in higher metal recoveries.

Seven kilometres north of the mine, the company completed a 34 000-metre diamond-drilling program on its **Kemess North** porphyry gold-copper deposit. The deposit was drilled off on approximately 100-metre sections. In 2001, the company had outlined an inferred resource of 422 million tonnes grading 0.4 g/t Au and 0.23% Cu, including a higher grade core of 170 million tonnes grading 0.5 g/t Au and 0.29% Cu. The 2002 drilling program confirmed the potential size and scope of the mineral resource and accumulated sufficient data to commence a pre-feasibility study.

The porphyry system at Kemess North, which has many similarities to the Kemess South system, is characterized by an extensive gossan 3.5 kilometres long. Within this area, the company has delineated a higher-grade porphyry dome carrying grades greater than 1 g/t gold equivalent. The dimensions of the dome are estimated at 700 by 400 metres, with a maximum thickness of 370 metres. Drilling intersected a deeper zone of mineralization in the Central Cirque area (*e.g.* drill hole KN02-55 intersected two intervals: 110.4 metres averaging 0.487 g/t Au and 0.141% Cu, and 140 metres averag-

TABLE 1 - Forecast Mine Production 2002

Mine	Operator	Deposit Type / Commodity	Estimated Production for 2002	Proven and Probable Reserves - 01/01/02)	Reference for Reserves
Metals					
Endako	Thompson Creek Mining Ltd / Nissho Iwai Moly Resources Inc	Calcalkalic porphyry Mo	5050 t Mo	84 400 000 t at 0.064% Mo (Oct 1/002)	Alan Morrish, written communication, 12/10/02
Eskay Creek	Barrick Gold Corp.	Transitional Epithermal-VMS	11 400 kg Au, 498 000 kg Ag	Shipping ore: 584 942 t at 66.3 g/t Au, 3119 g/t Ag. Milling Ore: 708 688 t at 23.2 g/t Au, 910 g/t Ag	Gary Biles, written communication, 01/31/02
Highland Valley Copper	Teck Cominco Limited / BHP Billiton Ltd / Highmont Mining Co	Calcalkalic porphyry Cu-Mo	182 000 t Cu, 2000 t Mo, 490 kg Au, 70,000 kg Ag	345 Mt at 0.41% Cu, 0.008% Mo	Production extrapolated from Teck Cominco Ltd, 3rd quarter report
Huckleberry	Imperial Metals Corporation	Calcalkalic porphyry Cu-Mo	34 500 t Cu, 540 t Mo	54 384 000 t at 0.480% Cu, 0.013% Mo, 0.055 g/t	J.C. Bottaro, written communication, 02/19/02
Kemess South	Kemess Mines Ltd (Northgate Exploration Ltd)	Calcalkalic porphyry Cu-Au	8550 kg Au, 31 800 t Cu	132.6 Mt grading 0.704 g/t Au and 0.233% Cu	Production extrapolated from Northgate 3rd quarter report
Myra Falls	Boliden-Westmin (Canada) Limited	VMS Cu-Zn-Pb-Au-Ag	9 875 t Cu, 57 670 t Zn, 1185 kg Au, 35,550 kg Ag	8.36 Mt grading 1.7% Cu, 6.9% Zn, 0.54% Pb, 1.4 g/t Au and 45.5 g/t Ag	Finley Bakker, written communication, 11/02
Industrial Minerals					
4J	Georgia Pacific Canada, Inc	Gypsum			
Ashcroft	IG Machine and Fibers Ltd (IKO	Basalt roofing granules			
Benson Lake	IMASCO Minerals Inc	Limestone			
Blubber Bay	Ashgrove Cement Corporation	Limestone			
Bud	Western Industrial Clay Products	Bentonite			
Buse Lake	Lafarge Canada Inc	Volcanic ash (alumina-silica)			
Craigmont	Craigmont Mines Joint Venture	Magnetite tailings			
Elkhorn	Westroc Inc	Gypsum			
Falkland	Lafarge Canada Inc	Gypsum			
Gillies Bay	Texada Quarrying Ltd	Limestone			
Giscome	Pacific Lime Products Ltd	Limestone			
Harper Ranch	Lafarge Canada Inc	Limestone			
Moberly	Highwood Resources Inc	Silica sandstone			
Monteith Bay	Monteith Bay Resources Ltd	Hotspring silica			
Mount Brussilof	Baymag Mines Co Ltd	Magnesite			
Mount Meager	Great Pacific Pumice Inc	Pumice, Pozzolan			
Nazko	Canada Pumice Corp.	Lava rock			
Pavilion	Greymont Western Canada Inc	Limestone			
Red Lake	Western Industrial Clay Products Ltd	Diatomaceous earth, Leonardite			
Sumas Mountain & Clayburn	Clayburn Industries Ltd / Lafarge Canada Inc / Tilbury Cement Ltd	Shale, Sandstone, Clay, Fireclay			
Van Anda	Imperial Limestone Co Ltd	Limestone			
Coal					
Bullmoose	Bullmoose Oper Corp (Teck Cominco Ltd)	Metallurgical coal	2.1 Mt	will close April, 2003 300 000 t	
Coal Mountain	Fording Inc	Metallugical coal	13 Mt for 3 Fording mines	33 Mt	
Elkview	Teck Cominco Limited	Metallugical coal	5.6 Mt	260.1 Mt	
Fording River	Fording Inc	Metallugical coal	13 Mt for 3 Fording mines	217 Mt	
Greenhills	Fording Inc	Metallugical coal	13 Mt for 3 Fording mines	110 Mt	
Line Creek	Sherritt Coal Partnership II	Metallurgical coal Thermal coal	2.6 Mt 400 000 t	28.5 Mt 3.3 Mt	
Quinsam	Hillsborough Resources Limited	Thermal coal	330 000 t (clean thermal coal)	30 Mt	S. Gardner, Hillsborough Res Ltd pers comm, Nov 2002
Willow Creek	Pine Valley Coal Ltd	PCI coal	48 345 t	15.6 Mt	

ing 0.44 g/t Au and 0.197% Cu). The best intersection graded 0.455 g/t Au and 0.19% Cu over 115.64 metres.

Drilling at the Nugget zone, 1 kilometre west of the proposed pit outline at Kemess North, has established that the gold-copper porphyry system at Kemess North is much larger and more continuous than previously known. Drill holes in the Nugget zone have returned intersections of gold-copper mineralization up to 159 metres thick over 300 metres strike-length. Drilling at Kemess East, 750 metres southeast of Kemess North, focused on finding the faulted-off eastern margin of the Kemess North deposit. About 20 kilometres northwest of Kemess North, Northgate completed a four-hole, 1650-metre diamond-drilling program on the **Brenda** property, under an option agreement with Canasil Resources Inc The property hosts both porphyry gold-copper and epithermal gold-silver targets. Northgate's 2002 exploration resulted in the discovery of a gold-bearing porphyry system, with mineralization hosted by Takla Group volcanic rocks and monzonite intrusions.

The **Highland Valley Copper** porphyry copper-molybdenum mine, a partnership among Teck Cominco Limited (63.9%), BHP Billiton Ltd (33.6%), and Highmont Mining Company (2.5%), is one of the largest open-pit operations in the world, ranking fourth or fifth on the basis of daily mill throughput in excess of 135 000 tonnes. The mine employs about 950 people and contributes about $450 million annually to the province. In

2002, the Government of British Columbia approved a plan by the partnership to remove excess ground water from around the pit to stabilize the walls and prevent flooding. The dewatering plan will help the mine operate until its scheduled closure in mid-2009. Exploration during 2002 consisted of an induced polarization survey on the **Pimainus** property, about 6 kilometres west of the mine.

The **Myra Falls** mine, owned by Boliden-Westmin (Canada) Ltd, has been in production since 1966. In excess of 22 million tonnes of massive sulphide, copper-zinc-gold-silver ore has been mined underground from several orebodies along a 6-kilometre northwest trend. From late 2001 to late March 2002, the mine was shut down and did not produce concentrate. The workforce was subsequently reduced by 17%. During the 3rd quarter of 2002, the mine again reported a profit. Costs were reduced by 20% compared to 2001. The higher precious metal and lower base metal production in 2002 reflects increasing production from the 43 Block and Gap zones. The construction of the Paste backfill plant began in late 2002, with completion scheduled for 2003. This will alleviate tailings disposal issues on surface. Definition drilling, totaling some 23 000 metres, was completed on the Battle-Gap, 43 Block, HW mine and Extension zones. Exploration was not carried out in 2002; a limited exploration program may be implemented in 2003. Discussions have continued with government agencies regarding the possibility of connecting the mine to the BC Hydro power grid, which would reduce operating costs significantly. Investigations have also begun regarding the possibility of providing custom milling services to owners of small, high-grade sulphide deposits on Vancouver Island.

At the **Endako** porphyry molybdenum mine, Thompson Creek Metals Company (75%) and Nissho Iwai (25%) continued milling at a daily rate of approximately 28 000 tonnes. The mine also has toll roasting contracts to process molybdenum concentrates from the Highland Valley Copper mine and the Los Pelambres (Chile) mine. During the first half of 2002, Endako benefited from higher molybdenum prices. However, falling prices towards the end of the year, as well as poor demand and roaster and shipping problems associated with labour disruptions in U.S. west coast ports, led the company to close the mine for two weeks in November. Continuing instability of the south wall of the Endako pit has necessitated revision of the mine plan.

Huckleberry Mines Ltd, owned by Imperial Metals Corporation (50%) and a consortium of Mitsubishi Materials Corporation, Dowa Mining Company Ltd, Furakawa Company Ltd and Marubeni Corporation (50%), mills approximately 21 000 tonnes of ore daily at the **Huckleberry** porphyry copper-molybdenum mine. The average grade of ore milled during 2001 was 0.522% Cu, and 0.016% Mo. The copper concentrate is trucked to Stewart for shipment to Japan, while the molybdenum concentrate is trucked to and sold in Vancouver. The milling target for 2002 was 8.1 million tonnes of ore grading 0.478% Cu, supplied from the Main and East zone pits. In the spring of 2002, employees agreed to their salaries and wages being tied to the price of copper; it is hoped that this measure will help the mine through any future low metal prices.

At the **Golden Bear** heap-leach gold mine, Wheaton River Minerals Limited and North American Metals Corporation continued with their decommissioning program. Commercial production ended in late 2001. During 2002, a small amount (approximately 70 kilograms) of gold was recovered from the leach pads.

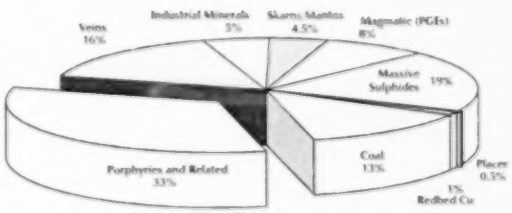
EXPLORATION PROJECTS

Porphyry and related deposits and volcanogenic and sedex massive sulphide deposits were the prime exploration targets in 2002 (Figure 8). Expenditures almost doubled for vein exploration compared to 2002, mainly in response to higher gold prices. While massive sulphides and coal exploration accounted for about 19% and 13% of expenditures, respectively (versus 28% and 22% in 2001).

The highlights of the 2002 exploration season include several advanced projects, *e.g.* **Afton, Sustut, Kena, Lorraine, Morrison, Cariboo Gold Quartz, Elk, Tam/Tsacha** and **Lustdust** (Figure 10). Selected highlight grassroots projects include **Fran, Tas, Crowsnest/Howell, William's Gold, Woodjam, Thorn, Hawk, Sib, Elizabeth, Turnagain** and **Pine (VIP)**. Major exploration projects, with expenditures in excess of $100 000, are listed in Table 2. As in 2000 and 2001, a number of new discoveries were made throughout the province, *e.g.* **Foremore** (SG zone), **Kemess North** (Nugget zone), **Hawk** (Zulu and Rainbow zones), **Jossa'lun, DP** (Tulameen), **Fir** (Upper zone), **Tas, Gold Canyon, Pil North** (East zone), **Myrtle, Pine** (VIP), **Del Norte** (Rill zone), **Eskay Creek** (44 zone) and **Gyll** (*see* Figure 9 and Table 3).

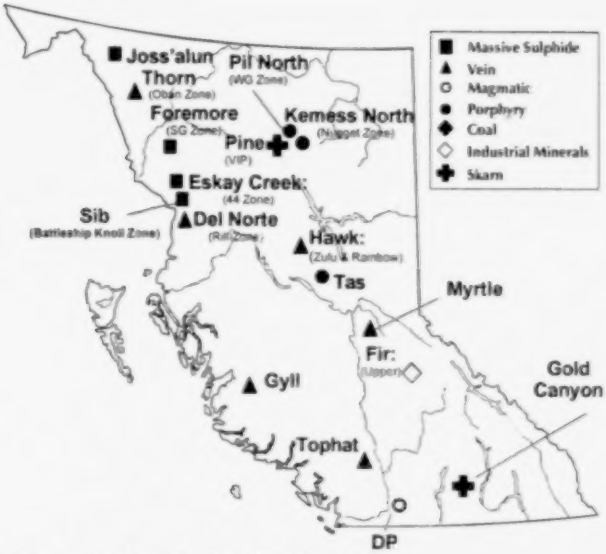
Projects in the Environmental Assessment Process include: **Cariboo Gold Quartz, Prosperity, Red Chris,** and **Silvertip**. Certified projects with amendments in-

Figure 8 ...



Exploration Targets 2002: by Deposit Type (%)

Figure 9 ...



New Discoveries in British Columbia - 2002

clude: **Mt Milligan** (1998), **Cirque** (1999), **Sulphurets (Bruceside)** (2001) and **Tulsequah Chief** (2002).

Porphyry and Related Deposits

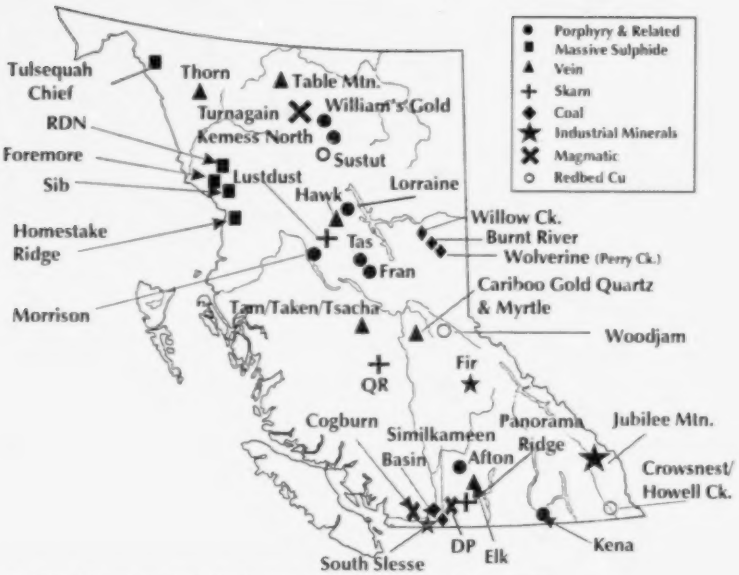
During 2002, DRC Resources Corp once again conducted a large, diamond-drilling program to test the deep mineralization beneath, and adjacent to, the northeast and southwest ends of the **Afton** porphyry copper-gold-silver-palladium deposit. According to the company, recent step-out drilling has extended the zone another 120 metres beyond the 2000-2001 boundary of the indicated mineral resource of 34.4 million tonnes grading 1.55% Cu, 1.14 g/t Au, 3.42 g/t Ag and 0.125 g/t Pd. Main zone mineralization has now been traced over a southwest-trending strike length in excess of 1000 metres, to depths greater than 300 metres and over a width of 140 metres. The most recent results indicate a widening of the zone towards the north. Also, the grade appears to be increasing (*e.g.* DDH - 66, drilled in the northwest portion of the deposit, beneath the west wall of the pit, assayed 1.20% Cu, 1.7 g/t Au, 4.3 g/t Ag and 0.21 g/t Pd over 200 metres. Included within this interval was a 24-metre section grading 2.43% Cu, 4.2 g/t Au, 6.6 g/t Ag and 0.31 g/t Pd.).

Within the Afton camp, Abacus Mining and Exploration Corp completed a modest drilling program on the **Rainbow** property, as well as regional exploration on the Coquihalla East and Iron Cap zones, which fall within the same southeast-trending structural corridor as the Afton, Pothook, Ajax and Rainbow deposits. Abacus is earning 100% of Teck Cominco Limited's interest in the Rainbow property and six additional properties near the former Afton mine. The company is very encouraged by the preliminary results from these programs.

At the **Kena** intrusion-related gold project near Nelson, Sultan Minerals Inc, and its new partner Kinross Gold Corp carried out a large exploration program. It focused on the northern part of the 17-kilometre long Silver King porphyry and included significant diamond-drilling, surface, and airborne geophysical surveys, soil sampling and geological mapping. Drilling was centred on the Gold Mountain zone where stepout drill holes were completed, as well as in-fill and deep drilling (>300 metres). Preliminary results from the deepening of holes previously drilled in the Gold Mountain zone discovery area include an intersection of 95 metres averaging 0.95 g/t Au over 95 metres, including 1 metre assaying 32.36 g/t Au. Initial metallurgical tests conducted in 2001 indicate that the gold is nonrefractory and that recoveries would be in the 92-97% range. A preliminary scooping study was prepared for the Gold Mountain Zone by Snowden Mining Industry Consultants, establishing a number of tonnage and grade scenarios for a range of processing methods and gold prices. Smaller drill programs were also undertaken on the Great Western and Starlight properties, located to the west of the Gold Mountain Zone and on the South Gold Zone, 4 kilometres to the south. The property has potential for large-tonnage, low-grade and heap-leachable gold deposits, as well as for high-grade (bonanza) auriferous veins.

Pacific Booker Minerals Inc, in a joint venture with Noranda Inc, completed another phase of extensive diamond drilling on its **Morrison** porphyry copper-gold property, as part of a program designed to resample the entire deposit on 60-metre centres and to depths of 300 metres. Based on drilling of 82 drill holes totalling 22 800 metres over the past three years, Pacific Booker initiated

Figure 10 ...



Selected Exploration Projects in British Columbia - 2002

two separate resource studies; one involving a computerized geostatistical resource estimation by SNC Lavalin of Toronto, and the second involving a manual geological resource estimation by in-house staff. As a result of the in-house evaluation of the drilling data, Pacific Booker has calculated resources within optimized and ultimate open pit models. The former identifies a starter pit with measured and indicated resources consisting of 12.4 million tonnes grading 0.53% Cu and 0.26 g/t Au; the latter contains a measured and indicated resource of 62.1 million tonnes grading 0.46% Cu and 0.22 g/t Au, both at a 0.3% Cu cutoff. The company has identified additional inferred resources and believes the deposit is open to the north, south and at depth and is initiating a feasibility study.

Drilling by Eastfield Resources Ltd on the **Lorraine** porphyry copper-gold property northwest of Germansen Landing concentrated on extending Lower Main zone mineralization, at the southwestern side of the large mineralized system. One of two holes drilled earlier in the spring returned a 51-metre intercept grading 0.89% Cu and 0.61% Au, contained within a larger, 149-metre intercept grading 0.57% Cu and 0.38 g/t Au. An additional four holes and an 11.6-kilometre induced polarization survey in other areas were completed. The All Alone Dome target area, 1.5 kilometres northwest of the Lower Main zone, contains a 500 by 500-metre chargeability anomaly, coincident with a large copper soil geochemical anomaly. This area will be a high-priority drilling target. Induced polarization anomalies were also outlined on and between the Eckland and Weber zones, to the southwest and southeast of the Upper Main zone.

Navasota Resources Ltd completed a 26 hole, 2900-metre diamond-drilling program on its **Fran** intrusion-related gold-copper property, 70 kilometres northeast of Fort St James and 30 kilometres southwest of Placer Dome Inc's Mt Milligan property. Pyrite, pyrrhotite, chalcopyrite and arsenopyrite in quartz veins within a monzodiorite body were drill tested along the northwesterly trending Bullion Alley zone, which includes the Hilltop, Midridge and Roadside areas. The favourable zone has been traced along a strike length of over 1800 metres and mineralized quartz veins have widths of up to 5 metres. On its **Tas** porphyry gold-copper property, 6 kilometres southeast of the Fran property, Navasota discovered structurally controlled veins containing pyrite, pyrrhotite, chalcopyrite and arsenopyrite and similar disseminated mineralization within a high level porphyry system, including an intrusion breccia.

Fifty kilometres southeast of Fernie, in the Flathead watershed, Goldrea Resources Corp completed diamond-drilling programs on the essentially contiguous **Howell** and **Crowsnest** intrusion-related gold properties, optioned from Eastfield Resources Ltd. Gold mineralization on both properties is associated with Cretaceous Flathead alkaline intrusions and carbonate-dominant sequences of the Mississippian Rundle Group. On the **Howell** property, previous work by Cominco Limited, Placer Dome Inc and Phelps Dodge Corporation of Canada Ltd tested three areas; the best drill intercept (Hole HRC-25) assayed 1.23 g/t Au over 58 metres. During 2002, Goldrea drilled three holes in the Eastern outlier, between Twentynine Mile fault and Harvey fault in area just west of hole HRC-25. The best intercept assayed 0.52 g/t Au over 149.4 metres. In addition, an airborne geophysical survey, completed in July, indicates a number

of magnetic and radiometric anomalies that the company believes are related to areas of intrusion into the host carbonate sequence. The spatial association of gold to the alkalic intrusions has led other researchers to compare Howell with the Cripple Creek region of Colorado.

On the **Crowsnest** property, previous work by Dome Exploration Ltd and Phelps Dodge located several boulders of magnetite-bearing syenite assaying up to 620 g/t Au. Subsequent trenching in the area of the boulders encountered quartz-veined syenite assaying up to 34.3 g/t Au (1 oz/ton); the best assay interval in trench 99-K-1 was 8.6 g/t Au over 16.5 metres. During 2002, Goldrea drilled 11 holes along a newly interpreted gold trend 200 metres to the south of trench 99-K-1, as a result of the discovery of mineralized syenite in this area. Hole DH02-03 assayed 0.40 g/t Au over 42.5 metres.

On the **Woodjam** porphyry gold-copper property, located 50 kilometres east of Williams Lake, Fjordland Exploration Inc, under an option agreement with Wildrose Resources Ltd, drilled five holes to test a 1600 by 800-metre chargeability anomaly only partially tested by previous drilling. Drilling targeted the possible northeasterly extension of structurally controlled low-grade gold mineralization. Hole 2002-25 intersected 54 metres grading 0.52g/t Au and 0.1% Cu. Fjordland believes the target is similar to the Kemess mine in northern British Columbia.

During 2002, Stikine Gold Corporation, under an option agreement with Rimfire Minerals Corporation, outlined a new bulk-tonnage intrusion-related gold target on its **William's Gold** property in the northern end of the Toodoggone-Kemess camp. Previous drilling in 1983-84, by a joint venture between Cominco Ltd and Dupont Exploration Ltd, indicated the presence of widespread, low-grade disseminated and fracture-filled gold mineralization enhanced by thinner high-grade intervals associated with quartz veins, on the T-Bill prospect, now part of the larger William's Gold property. One hole returned an intercept of 148.7 metres grading 1.17g/t Au, including a 2-metre interval grading 35 g/t Au. During 2002, Stikine Gold carried out induced polarization surveys, geological mapping and prospecting to refine targets for drilling in 2003.

In the Toodoggone region, 25 kilometres north of the Kemess mine, Finlay Minerals Ltd identified seven major coincident geochemical, geological and geophysical anomalous zones within its 5 by 3-kilometre **Pil North** porphyry gold-copper property. The East and Milky Creek zones have been identified as drill targets. The seven zones are underlain by monzonitic to dioritic rocks of the Early Jurassic Black Lake intrusive suite, which also host the Kemess South and North deposits.

In 2002, Orphan Boy Resources Inc acquired an option to purchase the **Willa** gold-copper-silver intrusion-related breccia pipe deposit, located near Silverton. The company plans to assess the feasibility of processing ore from the property in the Goldstream mill, located 90 kilometres north of Revelstoke. During the 1980s, the Willa property was explored by a joint venture between Rio Algom Exploration Inc and BP-Selco Inc In 1985, they delineated a resource of 3.4 million tonnes grading 1.34 g/t Au, 0.32% Cu and 4.8 g/t Ag in the near-surface Main zone, and a deeper West zone containing 1.8 million tonnes grading 2.93 g/t Au, 0.66% Cu and 9.3 g/t Ag. In April 1985, Northair Mines Limited joined the joint venture. It completed underground tunneling and core drilling by 1988, resulting in a reported drill-indicated resource of 635 000 tonnes grading 6.03 g/t Au, 0.92% Cu and 13.4 g/t Ag within the core of the West zone. Orphan Boy has acquired an extensive database related to the Willa property. It hopes to double the existing mineral resource by further exploration on the Main zone and to the northeast, at depth in the East zone and at depth between the East zone and the West zone. In the meantime, data compilation is continuing and will be the precursor to undertaking a feasibility study to be completed by June, 2003.

Late in 2002, Taseko Mines Ltd announced plans to finance a comprehensive core-drilling program near its **Gibraltar** copper-molybdenum mine. The 35 000-tonne-per-day mine mill has existing measured and indicated resources of 149 million tonnes grading 0.31% Cu and 0.01% Mo in a 12-year mine plan, plus additional measured and indicated resources of 596 million tonnes grading 0.28% Cu and 0.01% Mo. There are also in-pit oxide resources that would be processed in the existing solvent extraction-electrowining plant.

Taseko Mines Ltd is also reassessing the resource at its **Prosperity** copper-gold project, southwest of Williams Lake. Measured and indicated resources within an open pit designed for a potential 70 000 tonnes per day operation are estimated to be 490 million tonnes grading 0.22% Cu and 0.43 g/t Au.

American Bullion Minerals Ltd continued to seek a joint venture agreement on its **Red Chris** copper-gold project, which hosts a resource of approximately 120 million tonnes grading 0.58% Cu and 0.47 g/t Au.

Massive Sulphide Deposits

Klondike Gold Corp has assembled an exceptional database and sizeable land position covering a large area of the prospective Aldridge basin within Canada. During 2002, it conducted deep stratigraphic drilling to test its best Sullivan-type sedex targets, principally within the Panda-Payday basin (**Payday**, **Gerry Vent**, **Irishman Creek** and **Lewis** prospects), the Vine-DA Vent basin, the Cold Creek (**Cool Vent**) basin and the newly staked **Ash** property, 9 kilometres south of the Sullivan deposit in the Sullivan-North Star sub-basin.

On the **SIB** property, which adjoins the Eskay Creek mine to the south, Heritage Explorations Ltd validated its newly constructed three-dimensional exploration model, which identified nine exploration targets. In late September, Heritage arranged a financing of up to $500 000 with Kinross Gold Corporation for an eight-hole, 3070-metre diamond-drilling program. Drilling on the Lulu zone ex-

TABLE 2 - Major Exploration Projects - 2002

Property	Operator	MINFILE	NTS	Commodity	Deposit Type	Work Completed/Proposed
Ace	Barker Minerals Ltd	093A 142	93A/11W	Cu, Pb, Zn, Au, Ag	VMS	5 ddh, 646 m
Afton	DRC Resources Corp	092INE023	92I/10E	Cu, Au, Pd, Ag	Alkalic porphyry	Est. 25 holes, 10 000 m by year-end
Albert Creek	Logan Resources Ltd		104P/13	Ag, Zn, Pb	Manto	Mag, about 4 km, 1 ddh, 556 m
Ann North	GWR Resources Inc	092P 115	92P/14W	Cu, Au	Alkalic porphyry	12 ddh, 2400 m planned
Apple Bay	Electra Gold Ltd / Homegold Resources Ltd	092L 087-089, 150, 269, 308	92L/12	Silica, Kaolin	Hydrothermal alteration clays Al-Si	6 ddh, 550m
AxelGold	Rubicon Minerals Ltd	093N 196	93N/13W	Au, Cu	Alkalic porphyry	10 ddh, 1250 m
Baker / Chappelle	Sable Resources Ltd	094E 026	94E/06E	Au, Ag	Epithermal vein	10-15 ddh, ~1000 m, trenching
Brenda	Northgate Exploration Ltd	094E 147	94E/07E	Au, Cu	Calcalkalic porphyry	4 ddh, 1650 m; airborne geophys
Burnt River	Western Coal Corp	093P 007-008	93P/05W	Coal	Sedimentary	28 rdh, 1323 m; spot coring
BX (Josh)	Parkside 2000 Resources & Goldrea Resource Corp	104B 291	104B/10W	Cu, Au, Ag	Porphyry; Skarn	Geol, prosp; 9 ddh, 198 m
Cariboo Gold Quartz	Intn'l Wayside Gold Mines Ltd	093H 019	93H/04E	Au	Pyrite replacement, Mesothermal vein	8 ddh, 1500 m (est)
Coal Mountain	Fording Inc	082GSE052	82G/07E, 10E	Coal	Sedimentary	5975m RC drilling in 37 holes
Cogburn	Leader Mining International	092HSW081	92H/05E, 12E	Magnesium	Ultramafic-hosted Mg	38 ddh, 2152 m
Crowsnest	Goldrea Resources Corp	082GSE070	82G/02E	Au	Intrusion-related	11 ddh, ~ 610 m
DA Vent	Klondike Gold Corp	082GSW067	82G/05W	Pb, Zn, Ag	Sedex	1 ddh, 1171 m
Dauntless	SYMC Resources Ltd	092F 155, 168, 383	92F/02W	Cu, Ag, Au	Cu-Ag quartz veins	Access, trenching, planned drilling (5 ddh, 500m)
Del Norte	Teuton Resources Corp	104A 161	104A/04E	Au, Ag, Zn	Mesothermal vein	7 ddh, 365 m
DP	Bright Star Ventures Ltd	092HSE120, 142	92H/07W	Cu, Pt, Pd, Au	Magmatic?	6 ddh, 1024 8 m; road, grid; geophys, geochem, geol
Elizabeth	J-Pacific Gold Inc	092O 012	92O/02E	Au, Ag	Mesothermal vein	16 ddh, 1651 m, geochem, geol
Elk (Siwash North)	Almaden Minerals Ltd	092HNE096	92H/16W	Au, Ag	Mesothermal vein	26 ddh, 5012 m; trail
Elkhorn West	Westroc Inc	082JSW028, 021	82J/05W	Gypsum	Evaporite	66 ddh, 3656 m
Elkview Mine	Teck Cominco Ltd	082GNE015	82G/10W, 15W	Coal	Sedimentary	4672 m RC drilling in 62 holes
Eskay Creek	Barrick Gold Corporation	104B 008	104B/09W	Au, Ag	Epithermal VMS	37 surface ddh, 13,990 m; u/g drilling, 20 000 m
Fir	Commerce Resources Corp	083D 035	83D/06E	Ta, Nb, Phosphate	Carbonatite	5 ddh, ~900 m; mineral processing studies, geol, geochem; prosp
Fording River Mine	Fording Inc	082JSE009, 10, 12	82J/02W	Coal	Sedimentary	4600 m RC drilling in 10 holes
Foremore	Roca Mines Inc	104G 148	104G/02W	Cu, Zn, Ag, Au	VMS	Geol, prosp; contour soil geochem, rock trenching
Fran	Navasota Resources Ltd	093N 207	93N/16W	Au, Cu	Porphyry	26 ddh, 2912 m; geophysics
Frank Creek	Barker Minerals Ltd	093A 152	93A/11W	Cu, Pb, Zn, Au, Ag	VMS	6 ddh, 813 m
Getty West (Transvaal), Glossie	Getty Copper Corp	092INW040, 011	92I/11E	Cu, Mo, Ag, Au	Porphyry / Breccia	3 ddh, 750 m, 6 trenches, 360 m, geol, geochem
Greenhills Mine	Fording Inc	082JSE001, 005, 007	82J/02W	Coal	Sedimentary	4400m RC drilling in 32 holes
Harrison Lake	International Millennium Mining Corp	092HSW076	92H/05, 12, 13	Cu, Ni, Co, PGE	Magmatic Cu-Ni-PGE	Geol, geochem, grd geophy, airbrn geophy (planned)
Harrison Lake	Stellar Pacific Ventures Inc		92H/05, 12, 13	Cu, Ni, Co, PGE	Magmatic Cu-Ni-PGE	Geol, geochem, grd geophy, airbrn geophy (planned)
Hawk	Redcorp Ventures Ltd	094C 138-140	94C/04E	Au, Ag	Mesothermal vein	12 ddh, 1534 m, grid, geochem
Homestake Ridge	Teck Cominco Ltd	103P 016, 047, 091, 210	103P/12E	Au, Ag, Pb, Zn	VMS	21 ddh, 4375 m, geol, mini-excavator trenching
Howell	Goldrea Resources Corp	082GSE037, 082GSE048	82G/02E	Au	Intrusion-related	3 ddh, 328 m, airborne geophys

tended it; the best intercept assayed 19.5 g/t Au and 1600 g/t Ag over 11.7 metres. Approximately 2 kilometres north of the Lulu zone and 5 kilometres south of the Eskay Creek mine, drilling on the Battleship Knoll area resulted in the discovery of a new gold zone; the best intercept was 1.4 metres grading 8.24 g/t Au and 16.82 g/t Ag. In addition, a large regional geochemical survey outlined two new gold, multielement anomalies, most notably on the eastern side of the SIB property. A large follow-up exploration program is planned for 2003, including investigation of the remaining eight targets.

In 2002, Roca Mines Inc advanced its work on the North, SG and SG East mineralized zones on the **Foremore** property, located approximately 45 kilometres north of the Eskay Creek mine. Between 1987 and 1996, Cominco Limited conducted exploration programs, including diamond drilling through the More-Side Glacier, designed to locate the source of mineralized, massive sulphide boulders in the North and South boulder fields. Geological mapping, prospecting and limited rock trenching in 2002 above a south-flowing lobe of the More-Side Glacier led to the discovery of the SG zone with galena, sphalerite, pyrite and chalcopyrite, associated with quartz-rich segregations and quartz veining in quartz-sericite altered, foliated, felsic volcanic rocks. Sulphide mineralization, traced over a minimum length of 100 metres and a thickness of at least 4 metres, is both conformable and discordant and carries both base and precious metals. Teck Cominco Limited completed a follow-up diamond-drilling program on its **Homestake Ridge** property in the Upper Kitsault River area, 30 kilometres southeast of Stewart. The primary target is stratigraphy correlative to the host rock of the Eskay Creek mine. An area of abundant vein showings with Au-Sg-As-Hg-Zn-Pb mineralization and associated with coeval (?) subvolcanic hornblende-feldspar porphyry bodies, at the

TABLE 2 - Major Exploration Projects - 2002 - Cont'd

Property	Operator	MINFILE	NTS	Commodity	Deposit Type	Work Completed/Proposed
Jubilee Mountain	Tiger Ridge Resources Ltd	082KNE079	82K/16W	Barite	Veins, breccias	31 ddh, 2086 m; 1000 t bulk sample; 55 m drifting; 22 m raising
Kemess North (incl Nugget & Kemess E)	Northgate Exploration Ltd	094E 021	94E/02	Au, Cu	Calcalkalic porphyry	60 ddh, 34380 m, airborne geophys
Kena	Sultan Minerals Inc /Kinross Gold Corp	082FSW237, 331, 332	82F/06W	Au, Ag, Cu	Intrusion-related	39 ddh, ~9170 m, trenching, geol, gechem, airborne geophysics
Line Creek Mine	Sherritt Coal Partnership II	082GNE020, 021,	82G/15W, E	Coal	Sedimentary	45 holes RC drilling
Lone Peak	Golconda Resources Ltd	-	82G/12E	Au, Cu, Ag	Veins, Sedimentary Cu-Ag	8 ddh, 2054 m, geol, pros
Lorraine	Eastfield Resouces Ltd	093N 002	93N/14W	Au, Cu, PGE	Porphyry, Magmatic	13 ddh, 2508 m, geol
Lustdust	Alpha Gold Corp	093N 009	93N/11W	Au, Ag, Zn, Cu, Pb	Skarn, Manto, Porphyry	17 ddh, 5400 m, geol
Mineral Hill	Clearview Mineral Resource Corp / Tri-Sil Minerals Inc	092GNW052, 053	092G/12W	Wollastonite, Garnet	Wollastonite skarn	6 ddh, 1000 m
Morrison	Pacific Booker Minerals Inc	093M 007	93M/01W	Cu, Au	Calcalkalic porphyry	20 ddh, 5578 m
Mosquito Creek Gold	Island Mountain Gold Mines Ltd	093H 010	93H/04E	Au	Pyritic replacement, Mesothermal vein	5 ddh, ~500 m, trenching, prosp, geochem, IP
Myrtle	Intn'l Wayside Gold Mines	093H 025	93H/04E	Au	Mesothermal vein	5 ddh, 1000 m (est)
Panorama Ridge	Goldcliff Resource Corp	-	82E 031	Au	Skarn	Trenching, geochem
Pearson	Emerald Field Resources Ltd	092C 025, 068, 091, 094, 141, 142, 147	92C 050-059, 068-069	Cu, Ni, Co, PGE	Magmatic Cu-Ni-PGE	Sampling
Perry Creek	Western Coal Corp	093P 015	93P/03W	Coal	Sedimentary	Planned 16 rdh, 2000 m, spot coring
Pimainus	Highland Valley Copper	None	92I/06E	Cu, Mo	Calcalkalic porphyry	IP, grid
Pine (VIP, Wrich Hill)	Stealth Minerals Ltd	094E 047-048, 094E 082	94E/02E	Au, Ag, Cu	Epithermal vein (Wrich Hill), Skarn (VIP)	IP, mag, geochem, prosp, trenching
Praxis West	Northgate Exploration Limited	103O 016	103O/09E, 103P/12W	Au, Ag, Cu, Zn	VMS	5 ddh, 1945 m
QR	Cross Lake Minerals Ltd	093A 121	93A/12W	Au	Skarn	trenching, 19 ddh, ~1692 m
Rainbow	Abacus Mining & Expl Corp	092INE028	92I/09W	Cu, Au, Ag, Pd	Alkalic porphyry	10 ddh, approx 3000 m, geol, geochem
RDN	Barrick Gold Corporation	104G 144	104G/02E, 104B/05E	Au, Ag, Pb, Zn	Epithermal VMS	8 ddh, 1126 m, camp reclamation
Roman Mtn.	Cons Goldbank Ventures Ltd	-	93I/15W	Coal	Sedimentary	12 rdh, 1700 m, spot coring
Sadim	Toby Ventures Inc	092HNE095, 126	92H 078	Au, Ag, Cu	Vein, Porphyry	12 ddh, 1385 m, geochem
SIB, Eskay region	Heritage Explorations Limited	104B 376	104B/09, 10	Au, Ag	Epithermal VMS	Geol, geochem, 550 bulk silts, re-log core, drilling 3070 m
Similkameen	Connaught Energy Corp	092HSE227, 216, 212, 215, 224	92H/07E	Coal, Coalbed methane	Sedimentary	3 rdh, 2100 m
Slesse	IGM&F / Homegold Res Ltd	092HSW088-089	092H/04E	Limestone	Sedimentary	bulk sampling (5000 t)
Sustut	Doublestar Resources Ltd	094D 063	94D/10E	Cu, Ag	Volcanic redbed Cu	27 ddh, 2289 m infill & geotech program
3Ts	Southern Rio Resources	093F 055, 068	93F/02W, 03E	Au, Ag	Epithermal vein	11 ddh, 1313 m
Table Mountain	Cusac Gold Mines Ltd	104P 070	104P/04	Au	Mesothermal vein	Drilling, estimated 2000 m
Tas	Navasota Resources Ltd	093K 080	93K/16W	Au, Cu	Porphyry	7 ddh, 1270 m
Thorn	First Au Strategies Corp	104K 031	104K/10W	Au, Ag, Cu	High-sulfidation vein	Geol, prosp; 7 ddh, 472 m
Turnagain	Canadian Metals Exploration	104I 014	104I/07W	Ni	Magmatic	IP, 30 km; 7 ddh
Valentine Mountain	Beau Pre Explorations Ltd	092B012, 075	092B/12W	Au, Ag	Au quartz veins	Prospecting, planned drilling (5ddh/300m)
Ward	Jonpol Explorations Ltd	082ESE109, 111, 244	082E/07W	Au, Cu	Veins	9 ddh, ~460 m, trenching
West Moyie Block	Klondike Gold Corp	-	82F/08E	Pb, Zn, Ag	Sedex	2 ddh (1 extension), ~1800 m
Whistler Area Properties	Huckleberry Stone Supply Ltd	-	92G/14E, 92J/03E	Dimension Stone	Volcanic	Access, bulk sampling
William's Gold	Stikine Gold Corp	094E 092, 150, 182, 183	94E/13	Au	Intrusion-related Au	Three dimensional IP, 27 km
Woodjam	Fjordland Minerals	093A 078	93A/06W	Au, Cu	Porphyry	5 ddh, 1010 m
Yahk - Cold Creek	Klondike Gold Corp	-	82G/04W	Pb, Zn, Ag	Sedex	775m diamond drilling in one hole extension

contact of flow-banded rhyolite with overlying Salmon River Formation sedimentary rock, was tested along a strike length of 1400 metres. To the south, Teck Cominco conducted a geological evaluation of the Big Bulk intrusion-related gold prospect and the Leftover massive sulphide showings. Canadian Empire Exploration Corporation optioned these two properties in October.

At the **RDN** hot-spring massive sulphide target Barrick Gold Corporation, under an option agreement with Rimfire Minerals Corporation, completed a modest diamond-drilling program. The property is located approximately 40 kilometres north-northwest of the Eskay Creek mine. Unfortunately, due to technical difficulties encountered in the drilling, six of the holes in the Jungle anomaly area were lost and stopped short of target depth. The program was modified, with the new focus being further surface exploration to investigate additional targets on the property, particularly within the favourable stratigraphy along strike to the north. In addition to the Jungle anomaly, the Wedge zone (partially drill-tested by Newmont Exploration of Canada Limited in 2001) remains a high priority target. South and east of Cariboo

TABLE 3 - New Discoveries and Prospecting Highlights - 2002

Property or Claim Name		Location	Operator	Type
Foremore	SG zone	45 km NNW of Eskay Creek mine	Roca Res	VMS - Kuroko
Eskay Creek	44, Water Tower(21c), 22 zone	Eskay Creek mine	Barrick Gold	Epithermal VMS
Thorn	Oban zone	120 km SE of Atlin	Rimfire	High-sulphidation vein
Kemess North	Nugget zone	1 km W of Kemess North	Northgate	Porphyry Au-Cu
Hawk	Zulu and Rainbow zones	70 km NW of Germansen Landing	Redcorp	Vein-Mesothermal
Pil North	East zone	25 km N of Kemess South mine	Finlay Minerals	Porphyry Au-Cu
Sib	Battleship Knoll zone	5 km of Eskay Creek mine	Heritage Expl'ns	Epithermal VMS
Del Norte	Rill zone	30 km ENE of Stewart	Teuton	Veins-Mesothermal
Tas		65 km NE of Fort St. James	Navasota	Porphyry Au-Cu
Gold Canyon		5 km NE of Burton	Larry Black & George Buhler	Skarn, VMS?
Pine	VIP	25 km NW of Kemess South mine	Stealth	Skarn
Myrtle		30 km SE of Wells	Int'l Wayside	Vein-Mesothermal
Mosquito Creek	Kutney South zone	4 km NW of Wells	Int'l Wayside	Vein-Mesothermal
Fir	Upper zone	20 km N of Blue River	Commerce Res	Carbonatite
DP		10 km SW of Tulameen	Bright Star	Magmatic Cu - PGEs
Gyll		60 km SE of Bella Coola	Dan Epp	Vein-Mesothermal

Lake in the Barkerville area, Barker Minerals Ltd conducted two modest diamond-drilling programs to test the massive sulphide potential of its **Ace** and **Frank** Creek properties. Trenching previously exposed pyrite-rich massive sulphide lenses hosted in metasediments and volcanics of the Late Proterozoic Snowshoe Group. Massive sulphide mineralization with anomalous concentrations of copper, gold, silver, lead and zinc were encountered over narrow intervals on both properties; further exploration is planned.

In mid-December, the Province of British Columbia granted Redfern Resouces Ltd a Project Approval Certificate for its **Tulsequah Chief** polymetallic massive sulphide deposit located southwest of Atlin. Since the early 1980s when Redfern commenced exploration of the site, it has spent almost $30 million to define the deposit and design a development plan. A reserve estimate of 7.6 million tonnes grading 6.63% Zn, 1.31% Cu, 1.24% Pb, 105.2 g/t Ag and 2.51 g/t Au was identified in Redfern's 1997 feasibility study. This study proposed a 2500 tonne per day underground mine, mill and processing plant producing a gold-rich concentrate as well as zinc, lead and copper concentrates. Redfern intends to carry out a drill program designed to expand the current resource, followed by an updated feasibility study.

Precious Metal Veins and Bulk-mineable Deposits

Follow-up drilling by International Wayside Gold Mines Ltd on its **Cariboo Gold Quartz** mesothermal gold project in the Wells-Barkerville camp tested several targets along a northwest trend of approximately 7 kilometres, from the Bonanza Ledge zone west to the Mosquito Creek Gold mine. The company's claim holdings cover a strike length of approximately 50 kilometres, including the former producing mines Cariboo Gold Quartz, Aurum, Island Mountain, Mosquito Creek, Cariboo Hudson, Cariboo Thompson and Hardscrabble Tungsten. Encouraging drilling results were obtained along the BC Vein/Bonanza Ledge trend, which has been traced for 1250 metres along strike and down dip for 305 metres. The Bonanza Ledge prospect has been interpreted to be a zone of auriferous replacement mineralization that encompasses at least five parallel, lenticular subzones. The total indicated resource for the Bonanza Ledge, BC Vein and Cow Mountain (Saunders, Pinkerton and Rainbow zones) areas is estimated by the company to be 6 645 600 tonnes grading 2.67 g/t Au, at 0.7 g/t Au cutoff. The total inferred resource for these three areas at same cutoff grade is estimated to be 1 858 400 tonnes grading 2.02 g/t Au. The company is examining the possibility of open-pit mining of all three areas and using a central mining facility. On Island Mountain, the company tested an area approximately 500 metres south of the previously explored Kutney zone on the Mosquito Creek property. A northwest-trending zone, 730 metres long, with quartz-pyrite ± arsenopyrite ± galena veins and associated quartz stockworks is hosted by silicified and pyritized phyllitic quartzite. It is interpreted to be part of the Bonanza Ledge stratigraphy, approximately 300 metres below the mine trend.

On the **Myrtle** gold property, which adjoins the Bonanza Ledge zone to the east, International Wayside, under an option agreement with Gold City Industries Ltd, discovered significant quartz-pyrite vein mineralization in Rainbow Group rocks, approximately 300 metres into the hangingwall of the BC Vein/Bonanza Ledge zones.

In 2002, Almaden Minerals Ltd, under a joint venture agreement with Wheaton River Minerals Ltd, completed a large diamond-drilling program on its **Elk** (Siwash North) epithermal gold-silver vein, located in the

Okanagan area. Past production totaled 1600 kilograms (51 500 oz) of gold from 16 500 tonnes of open-pit and underground ore mined in the mid-1990s. Prior to this year's drilling, the total resource on the property was 111 500 tonnes grading 39.53 g/t Au. A new resource calculation, incorporating the 2002 drill results, is in progress. This year's program tested the WD vein system, the Deep B shoot, the Gold Creek West vein and the Bullion Creek structure. The WD vein is located 200 metres north of the B vein system, 50-metre step-out drill holes, to the south and east, intersected the vein near the projected depth. Two holes drilled into the Bullion Creek structure, 700 metres north of the B vein, intersected gold mineralization and narrow pyritic veins in altered granodiorite. Four holes drilled on the Gold Creek West vein, 400 metres southwest of the mine site, intersected the vein at the projected locations and have extended its continuity to 290 metres along strike. The Deep B shoot on the B vein system is located immediately below the mine workings. It contains an inferred resource of 11 000 tonnes grading 100 g/t Au. Four perimeter holes were completed, designed to extend the Deep B shoot downplunge.

Seventy kilometres northwest of Germansen Landing, Redcorp Ventures Ltd completed a modest diamond-drilling program on its **Hawk** mesothermal gold vein property. The AD, Radio North, Radio South and newly discovered Zulu and Rainbow quartz-pyrite-hematite-chalcopyrite ± native gold veins, breccias and quartz stockworks in altered granite were all successfully intersected. The best intersection from the 2002 program on the AD vein, averaged 4.66 g/t Au, 25 g/t Ag and 0.48% Cu over an estimated true width of 5 metres, at a vertical depth of over 100 metres. The Radio North and South veins, discovered in 1990 by Cyprus Gold Ltd, were traced by mapping and sampling over a strike length of 1500 metres and a vertical range of 400 metres. The veins extend to the SW zone, giving a total strike length of over 3000 metres. Five holes drilled in 2002, along 1300 metres of strike length, intersected narrow quartz-sulphide veins, hosted in syenite; the best intercept assayed 18.8 g/t Au, 7.4 g/t Ag and 1.6% Cu over 0.21 metres. The Zulu vein, discovered earlier in the year, was traced on surface for over 450 metres and by drilling over a strike length of 60 metres and a vertical depth of 100 metres. The best intersection assayed 29.27 g/t Au, 6.8 g/t Ag and 0.82% Cu over a 0.2 metre estimated true width. The Rainbow vein, located 200 metres south of the Zulu vein, was also discovered this year and has been traced for 315 metres along strike.

Northwest of Lillooet, J-Pacific Gold Inc completed a modest diamond-drilling program on its **Elizabeth** mesothermal gold vein property. The primary targets were the West and Main veins, both of which returned high gold values in previous surface and underground sampling. A secondary target was a newly discovered zone of quartz stockwork mineralization. Geochemical sampling was also carried out over potential vein extensions and for the discovery of additional mineralized zones in the main area of mineralization, and also included sampling of the No. 9 vein, located approximately 600 metres northwest of West vein. This project is about 45 kilometres from the company's **Blackdome** mine/mill and could perhaps provide custom milling ore, if tonnage can be developed. J-Pacific also carried out initial work on its newly staked Blackdome South project, contiguous with its Blackdome gold mine.

Southern Rio Resources Ltd, under option agreements with Teck Cominco Limited and Phelps Dodge Corporation of Canada Ltd, carried out a modest diamond-drilling program on the **3Ts** project, comprised of the **Tsacha**, **Tam** and **Taken** epithermal gold-silver vein properties, located approximately 120 kilometres southwest of Vanderhoof. Using data from previous drilling and trenching completed by the Teck Cominco, Southern Rio reports an inferred resource of 470 000 tonnes grading 7.4 g/t Au and 65.22 g/t Ag at a 4 g/t Au cutoff for the Tommy vein on the Tsacha property. Drilling on the Tsacha property targeted the central portion of the Tommy vein resource, the projected northern extension of the Tommy vein, beneath a post-mineral felsite sill, and the southern projection of the Larry vein. The two holes which tested the northern extension of the Tommy vein extended its known strike length from approximately 600 metres to over 1 kilometre. Drilling on the Ted vein on the **Tam** property, south of a Phelps Dodge drill hole, which returned an intercept of 22 metres grading 8.9 g/t Au and 39.4 g/t Ag in 1996, has traced the mineralized structure along a strike length of 250 metres and across widths generally in excess of 10 metres.

In the Toodoggone region, Stealth Minerals Ltd explored its **Wrich Hill** and **Goat** epithermal gold-silver vein prospects (part of the **Pine** property), approximately 15 kilometres north of the Kemess mine. In December, Bishop Resources Inc signed a letter of intent with Guardsmen Resources Inc, involving the consolidation of the **Lawyers**, **Silver Pond**, and **Al** epithermal gold-silver vein deposits, north of the Kemess mine.

Teuton Resources Corporation discovered the Rill zone on its **Del Norte**, mesothermal gold-silver vein/breccia property, approximately 30 kilometres east-northeast of Stewart. Sulphide mineralization includes pyrite, galena, sphalerite and tetrahedrite in quartz veins and quartz-cemented breccia in Salmon River Formation argillites. Teuton completed a small diamond-drilling program; one hole intersected 31.1 metres grading 3.56 g/t Au and 192.3 g/t Ag.

At the **Table Mountain** gold mine in the Cassiar district of northwestern British Columbia, Cusac Gold Mines Ltd completed a modest diamond-drilling program, designed to test its newly defined East Bain vein mineralized structure. The mine has been on care and maintenance status since 1999, due primarily to low gold prices. Previously, the mine yielded 8900 kilograms (286 000 oz) of gold from high-grade, gold-bearing mesothermal veins. The 2002 drilling has defined a resource of 22 000 tonnes grading 33.78 g/t Au on the east extension of the Bain

vein. Vein widths average 1.45 metres. Past production from the Bain vein was about 55 000 tonnes grading 14 g/t Au. Cusac has commenced plans for production and financing aimed at reopening the mine, based on the newly defined resource. At the **Thorn** high-sulphidation, structurally controlled, intrusion-related gold-silver-copper property, 125 kilometres northwest of Telegraph Creek, First Au Strategies Corporation, under an option agreement with Rimfire Minerals Corporation, drill tested the Tamdhu, Oban and I veins hosted in argillized quartz-biotite porphyry over a 1.2-kilometre trend. The property hosts 17 significant vein showings containing pyrite, enargite and tetrahedrite over a 5 by 5-kilometre area. Prospecting earlier in 2002 discovered the Oban zone, where a float sample of massive sulphides-sulphosalts assayed 6149g/t Ag, 3.5g/t Au, 40% Pb and 3.5% Zn. Follow-up drilling intersected heterolithic breccia with a pyrite-rich matrix. Clasts and matrix are pervasively sericitized and pyritized. Another new discovery, the Glenlivet zone, was sampled intermittently over a 210-metre strike length. Grab samples assayed up to 2580 g/t Ag, 20.39 g/t Au, and 23.9% Cu.

Skarn/Manto Deposits

Alpha Gold Corp completed a nineteen-hole, 7800-metre diamond-drilling program testing the auriferous skarn/manto part of a large porphyry system on its **Lustdust** property, 150 kilometres northwest of Fort St. James. Drilling targeted skarn and replacement mineralization at depth along the eastern margin of the Eocene Glover monzonite stock, primarily south of Canyon Creek. Copper-gold grades appear to be highest in exoskarn that has developed over widths of 6 to 20 metres along the contact between calcareous mafic tuff and limestone. Drilling has traced favourable Cache Creek Group host rocks along a strike length exceeding 500 metres, across a width varying from 3 metres to greater than 110 metres, and to depths exceeding 400 metres. Hole DDH2-09 assayed 36.7g/t Au, 182.64g/t Ag and 2.89% Cu over 9.7 metres, at depths between 419 and 429 metres. In addition, strong gold-copper mineralized zones were located both along the limbs, and in the core, of a north-northwesterly plunging synform-antiform couple. This structure has been drill tested over a strike length exceeding 300 metres. Higher-grade gold mineralization is associated with massive sulphide replacement zones developed at the contact between the retrograde skarn and limestone (*e.g.* hole DDH 2-02 assayed 61.3g/t Au, 181g/t Ag and 0.87% Cu over one metre).

Six kilometres east of Hedley and 3.5 kilometres east of the past producing Nickel Plate mine, Goldcliff Resources Corp completed surface exploration, including trenching, on its **Panorama Ridge** auriferous skarn project. Trenching was conducted on the York, Spar and Epic prospects that contain coincident geological, geochemical and geophysical gold-related anomalies. At the York prospect, mineralization averaging 0.59g/t Au across 86 metres, was located in one of two trenches. High gold values from stream sediment samples collected from a westerly draining tributary of Winters Creek triggered additional staking in the area.

Late in 2002, Cross Lake Minerals Ltd and Gold Giant Ventures Inc, under an option agreement with Kinross Gold Corporation, completed a 1690-metre diamond-drilling program on the inactive **QR** gold skarn mine, which has been on care and maintenance status since April, 1998. The mine produced approximately 3700 kilograms of gold from open pits and underground stopes. Proven and probable reserves estimated by Kinross, as of January 25, 1999, totaled approximately 320 000 tonnes grading 5.1 g/t Au. Additional resources included 463 000 tonnes grading 5.0 g/t Au. Six zones of gold mineralization have been outlined, of which two (Main and West) were mined. Cross Lake's main exploration focus is to expand the known mineralization, especially the Northwest and North zones, which the company believes to be the faulted extensions of the Mid-West and Main zones. During the summer, Cross Lake completed data compilation, preliminary field surveys, and commissioned an independent reserve and resource study. A number of additional gold targets have been identified on the property.

In the Toodoggone region, some 20 kilometres northwest of the Kemess mine, Stealth Minerals Ltd, under an option agreement with Electrum Resource Corp, completed geological, geochemical and geophysical surveys and trenching on its **VIP** copper-gold-silver skarn zone, in the western part of the **Pine** property. Trenching on three mineralized zones (West, North and East) outlined two parallel, easterly trending areas of skarn mineralization from 10 to 20 metres wide. In addition, four new zones of mineralization [Northwest, Northeast, South and Southwest (343 Creek)] were discovered. Most of the trenching was on the East zone; the favourable skarn zone is at least 550 metres in long.

Near Burton, Larry Black and George Buhler discovered potentially significant auriferous skarn or polymetallic massive sulphide mineralization on their **Gold Canyon** property, located approximately 2.5 kilometres west of the Tillicum auriferous skarn deposit (*see* Figure 9; Table 3).

No exploration was conducted at the **Silvertip** zinc-silver skarn/manto property, 85 kilometres southwest of Watson Lake, but Imperial Metals Corporation entered into an agreement for the sale of the property to Silver Standard Resources Inc, late in 2002.

Magmatic Deposits

The search for nickel, copper, and platinum group elements associated with magmatic deposits attracted about 8% of exploration spending in 2002. Drilling was conducted on only two such projects; significant ground acquisitions and preliminary surveys were carried out on the others. On the **Turnagain** nickel prospect, 110 kilometres east of Dease Lake, Canadian Metals Exploration Ltd completed a modest diamond-drilling program fo-

cused on an induced polarization target with dimensions of over 2500 by 1000 metres. It is 400 metres north of the previously drilled Horsetrail zone of extensive disseminated, net-textured, and semi-massive and massive sulphide mineralization containing nickel, cobalt, copper and platinum group metals. The objective of the 2002 drilling program was to extend the known limits of mineralization on the western side of an anomaly that has been drilled over a strike length of 2.5 kilometres. The company believes that the property has the potential to host a bulk-tonnage, low-grade deposit. Concurrently, the company will undertake further metallurgical studies to assist it in calculating the overall extent and grades of the resource. Previous metallurgical testing demonstrated amenability to concentration by flotation methods.

Near Olivine Mountain, southwest of Tulameen, Bright Star Ventures Ltd completed a six-hole, 1000-metre diamond-drilling program on its newly discovered **DP** zone, as part of its ongoing investigations of the platinum group metals potential of the region. Disseminated and fracture-controlled, magnetite-pyrite-chalcopyrite mineralization, hosted by hornblende-bearing clinopyroxenite, trends north-northwesterly over an area 1200 metres long and 500 metres wide. A palladium-platinum-copper-gold lithogeochemical anomaly measuring 300 by 200 metres was the focus of the 2002 drilling program. This discovery appears to represent a new style of mineralization for the Tulameen Complex; however, it is not yet clear if the mineralization is magnetic or if there is an epigenetic component.

On the eastern side of **Harrison Lake** area, Stellar Pacific Ventures Ltd and International Millennium Mining Corp continued geological, geochemical and ground geophysical surveys on several areas in the search for magmatic Cu-Ni-PGE deposits. A favourable, 2 to 10-kilometre wide north-northwesterly trending belt of sulphide-bearing ultramafic bodies, in contact with metasedimentary rocks, was the focus in 2002. This belt extends northwesterly for over 60 kilometres from the former Giant Mascot nickel producer.

In the Port Renfrew and Jordan River areas of southwest Vancouver Island, Emerald Field Resources Ltd optioned the **Pearson** magmatic copper-nickel-platinum group elements prospect and completed preliminary prospecting, geochemical surveys and additional staking. Over 30 peridotite bodies, part of the West Coast Complex, have been identified in the area. These occurrences correspond to a strong aeromagnetic anomaly, trending roughly easterly, with dimensions of 25 to 30 kilometres in length by 5 to 10 kilometres in width. Disseminated to net-texture pyrrhotite, with lesser pyrite and chalcopyrite, is fairly common in these cumulate peridotite bodies. Locally, exposures of semi-massive to massive sulphide mineralization were located (*e.g.* Fairy Main and Granite Creek Main logging roads). An airborne-geophysical program is planned.

At Leader Mining International Corporation's **Cogburn** magmatic magnesium-metal project, northeast of Harrison Hot Springs, a modest diamond-drilling program in early 2002 led to the calculation of a preliminary measured mineral resource of 25.5 million tonnes grading 24.5% Mg by weight in its proposed Emory zone quarry (300 by 300 metres). Additional studies were carried out, related to the production feasibility study to be completed in early 2003.

Redbed Copper Deposit

During 2002, Doublestar Resources Ltd completed a large in-fill and definition diamond drilling on its **Sustut** redbed copper project, approximately 65 kilometres south of the Kemess mine in north-central British Columbia. The company also conducted baseline environmental studies, geotechnical studies and metallurgical testing, the results of which have led it and its equal financing partners, Northgate Exploration Ltd and Procon Mining and Tunneling Ltd, to initiate a feasibility study on the project. The study will be based on new ore reserve calculations that are in progress. Previously, Falconbridge Limited had calculated a resource in the Southeast zone of 5 937 000 tonnes grading 1.87% Cu and 6.11 g/t Ag, at a copper cutoff of 0.70 %. Adjacent to the Southeast zone, additional resources of 3.95 million tonnes grading 1.25% Cu and 8.6 million tonnes grading 0.73% Cu (at a cutoff of 0.40% Cu) were reported by Falconbridge in two other zones. The partnership expects to complete the feasibility study in early 2003. In the event that the study is positive, it proposes that ore from the Southeast zone quarry will be mined and trucked to Northgate's Kemess mine, where it will be treated. The Sustut material is expected to increase Kemess's copper production by 40%, boost the grade of the concentrate, improve the quality of the tailings, and reduce the amount of steel required in the semi-autogenous grinding mills

Placer Deposits

Placer gold±platinum exploration in British Columbia was concentrated in the Atlin (**Ruby Creek**), Dease Lake (**Thibert Creek**) and Manson Creek (**Manson Creek** and **Slate Creek**) areas during 2002. Minor programs were carried out in the Cariboo and Fort Steele areas.

COAL

Globally, the year 2002 was marked by very protracted negotiations for prices of coking coal into Japan and contracts were not finalized with the Australians until July and even later for the Canadians. The negotiations delayed coal shipments in the spring and some companies lost sales as a result. In general, hard coking coal prices ranged from US$45 to $50 per tonne. The average price of hard coking coal sold by Fording Inc (Canada's largest export-coal producer) through 2002 was in the range US$38 to $39 per tonne. The small tonnage of thermal coal sold offshore usually sells for a premium price (US$27 to $30 per tonne) because of long-term contracts. Prices for pulverized coal injection (PCI) coal, and semi-soft cok-

ing coal, were in the range of US$32 to $33 per tonne. These prices are substantially lower than last year; in part because of an increased supply of thermal coal from China.

In the last few years there have been a number of ownership changes and consolidations in the coal mining industry. At the time of writing, Fording Inc is attempting to join forces with Teck Cominco Limited and Westshore Terminals Income Fund to create a huge coal income trust.

British Columbia will export an estimated 23.3 million tonnes of coking coal and 0.81 million tonnes of thermal coal, for a total of 24.1 million tonnes, down from 27.1 million tonnes in 2001. Next year, when the **Bullmoose** mine closes, production will decrease a further 1.8 million tonnes. If Fording Inc is unable to increase sales in 2003, then production may drop to about 22.3 million tonnes, which is similar to 1993-94 production levels. Next year will probably be very competitive for British Columbia coal mines. Teck Cominco Limited and Fording Inc agreed to form a joint venture to examine the feasibility of constructing and operating a power generation plant in the Elk Valley in the southeast. The project would utilize unwanted materials from the coking-coal operations of both companies, at Elkview and Fording River. A new provincial Energy Plan, which outlines emission guidelines for coal-fired electrical generating stations, will be in place by early 2003.

OPERATIONS

In the following section, tonnages reported are clean tonnes. The annual production at a mine may not match sales because of changes in inventory at mines and ports.

The **Fording River**, **Greenhills** and **Coal Mountain** mines, operated by Fording Inc, expect to produce 13 million tonnes of coal in 2002, most to be transported by train to the port in Vancouver for shipment to world markets. This is a decrease of 3.5 million tonnes from 2001. At **Fording River**, out-of-pit development drilling totaled 4600 metres. At **Greenhills**, in-pit drilling totaled 4400 metres. At **Coal Mountain**, 21 holes totalling 5000 metres were drilled within active pits. Proven and probable resources at January 1, 2002 at Fording River, Greenhills and Coal Mountain were 217 million tonnes, 110 million tonnes, and 33 million tonnes, respectively. At existing full production, the respective mine lives are 24, 20 and 13 years.

Fording invests about $40 million annually in replacements and upgrades at its mines. The close proximity of the three operations allows for a level of knowledge and technology sharing. Fording River and Coal Mountain have 825 and 175 employees, respectively. In December, Fording approved a transaction with Teck Cominco Limited and Westshore Terminals Income Fund to join forces and create a huge coal income trust. This new Fording Income Trust would own all the existing businesses of Fording, and through the newly formed Fording Coal Partnership, would combine Fording's coal operations with the metallurgical coal assets of Teck Cominco, including the Elkview mine, but excluding the Bullmoose mine. The proposed agreement calls for the Fording Coal Partnership to be approximately 62% owned by the Fording Income Trust and approximately 38% by Teck Cominco. Westshore's investment will finance the purchase of trust units. The new partnership would produce more than 20 million tonnes of metallurgical coal per year and generate annual revenues of approximately $1.5 billion.

Production at the **Line Creek** mine (Luscar Energy Partnership) in 2002 is estimated to be 2.6 million tonnes of coking coal and 0.4 million tonnes of thermal coal. In-pit drilling totaled 15 200 metres in the Saddle, MSA and NLC areas. Proven and probable resources at January 1, 2002 were 28.5 million tonnes of metallurgical coal and 3 million tonnes of thermal coal.

Production at the **Elkview** (Teck Cominco Limited) mine is estimated to be 5.6 million tonnes in 2002. Resources in the present mine plan are over 260 million tonnes of metallurgical coal, which represents more than 40 years of a mine life. In 2002, 66 holes totaling 2695 metres were drilled within active pits for mine planning. Twenty- six holes, totaling 1980 metres, were drilled outside the pit to delineate long-term reserves.

The **Bullmoose** (Teck Cominco Limited) mine is preparing to close in April 2003, but is expected to produce 2.1 million tonnes in 2002 and another 300 000 tonnes in 2003 before it closes.

The **Quinsam** (Hillsborough Resources Limited) mine continues to operate below capacity and expects to produce 330 000 tonnes of thermal coal in 2002. A small exploration program was carried out. Proven and probable resources at January 1, 2002 were 30 million tonnes.

The **Willow Creek** (Pine Valley Coal Ltd) mine, owned two-thirds by Globaltex Industries Inc and one-third by Mitsui Matsushima Canada Ltd, produced 48 300 tonnes of PCI coal. The company completed a revised feasibility study, based on a 900 000-tonne-per-year mining operation and a 14-year life. Proven and probable resources are estimated at 15.6 million tonnes.

At the **Basin** (Tulameen) coal project, Compliance Energy Corp and Nissho Iwai Coal Development (Canada) Ltd mined about 10 000 tonnes of thermal coal. Raw coal is trucked to a recently completed wash plant at the Similco mine site, about 45 kilometres from the pit, and washed to meet market demands. Measured and indicated resources are 19 million tonnes.

EXPLORATION PROJECTS

Exploration expenditures at mine sites and elsewhere have dropped significantly, from $6.4 million in 2001 to $4.6 million in 2002. This total excludes coalbed methane (CBM) exploration or combined CBM and coal exploration that was permitted under the Oil and Gas regula-

tions. An estimated $2.02 million were spent on exploration on mine sites in active pits and $2.64 million on out-of-pit, or grassroots expenditures. Drilling on coal programs totalled approximately 44 000 metres, down approximately 50% from 2001. Exploration expenditures do not include the costs for bulk samples obtained for the purpose of test marketing. A number of new coal licenses were picked up by mining companies in the northeast, southeast, northwest and south-central parts of the province, as well as on Vancouver Island.

Northeast British Columbia

Western Canadian Coal Corporation initiated a rotary and core-drilling program late in 2002 on its **Wolverine (Perry Creek)** property, about 20 kilometres west of Tumbler Ridge, and may develop an adit over the winter to further test the metallurgical coal measures. Detailed engineering studies are in progress and a construction start is anticipated for September 2003. Commercial production of approximately 1.7 million tonnes per year of metallurgical coal for export markets is scheduled for 2004. At its nearby **Burnt River** project, Western Canadian completed 1300 metres of drilling, Consolidated Goldbank Ventures Ltd completed a modest rotary and spot-core drilling program on its **Roman Mountain** property, southeast of the Quintette mine.

Southeast British Columbia

In southeast British Columbia, all coal mines have conducted in-pit drilling and some have continued exploration outside their active mine areas. The only mine proposing grassroots exploration is Coal Mountain Collieries, which plans an exploration program in the **Crowsnest Coalfield**.

South-Central Coalfields

A major coal exploration program was undertaken on the **Similkameen** property in the Princeton area by Connaught Energy Corporation. Three core holes were drilled for an aggregate length of 2100 metres. It was permitted under the Coal Act, but included an interest in the coalbed methane (CBM) potential of the area. The company was granted a coalbed methane licence in September; it has since entered an option agreement related to the CBM potential of the property.

Vancouver Island

A number of mining companies proposed exploration but all projects were put on hold for 2002. Hillsborough did spend a small amount on exploration at its **Quinsam** mine. A number of companies did, however, pick up coal licenses.

Northwest British Columbia

Fortune Minerals Limited has acquired the **Mt Klappan** anthracite coal property from Conoco Canada Resources Limited, for an undisclosed amount. Plans have not been announced for exploration. Measured and indicated resources total 260 million tonnes; inferred and speculative resources total 2.54 billion tonnes in four deposits. Consolidated Global Minerals Ltd has acquired a 50% interest in two coal licenses in the **Tuya Coalfield** from Mayan Minerals Ltd.

INDUSTRIAL MINERALS

The value of industrial mineral production in 2002 is estimated at $46 million, and mineral exploration expenditures are an estimated $1.7 million, which is about 5% of the exploration investment in the province in 2002. Production is expected to increase this year, even while exploration expenditures declined. Over 10 000 metres of exploration drilling were completed on ten major projects.

The most economically significant industrial minerals produced are magnesite, white calcium carbonate, limestone, silica, dimension stone, gypsum, sulphur, construction aggregate and crushed rock. Commodities produced in lesser quantities include jade (nephrite), magnetite, dolomite, barite, volcanic cinder, pumice, flagstone, clay, tufa, fuller's earth and zeolites. There are more than 40 mines or quarries and at least 20 major sites where upgrading of industrial minerals into value-added products takes place, not counting the aggregate operations listed by the British Columbia Aggregate Producers Association. Most operations are concentrated close to existing infrastructure and markets (*see* Figure 7 for selected major operations).

Trends

Over the last three years, the most significant industrial minerals trend in British Columbia has been an increasing export of crushed stone and natural aggregate to urban centres along the west coast of the United States. This market, however, is becoming very competitive as industry identifies new potential for development.

Another important trend, which was not apparent during the 1990s, is the increase in value-added processing of raw industrial minerals. In 2001, the **Ashcroft** basalt quarry and related roofing-granule plant opened. The plant reached 50% of its design capacity of 500 000 tonnes in mid-July, 2002. The continuous investment by Roxul (West) International Inc in its mineral wool plant near **Grand Forks** also supports this trend. In November 2002, Clayburn will start trial runs to produce lightweight aggregate based on the material from its **Sumas Mountain** shale quarry. On a smaller scale, an increase in the number of flagstone operations, and a significant interest in tufa and other landscaping materials has been noted. Such projects do not require major capital investments and are ideally suited for family-type businesses.

It is expected that over the next few years, new opportunities will arise in the field of green minerals along the west coast. Green minerals are those that can be used in environmental clean-up, agriculture, waste disposal or otherwise improve the environment. Agricultural mar-

kets for zeolites appear to be improving this year and they may further benefit from the lifted moratorium on new salmon-farm developments in the province. British Columbia has a number of well-documented bentonite deposits and several deserve rigorous laboratory testing. Depending on test results, some of these deposits could supply material for linings and barriers in waste disposal applications, and potentially for drill-mud applications. Assuming that offshore development drilling proceeds in British Columbia, and that BC bentonite meets specifications, this could develop into an important sector.

Starting in 2002, there may also be an increase in the search for pozzolans near major population centres (pozzolan is a material sought after for its cementing properties). Exploration for deposits of specialty, natural and lightweight aggregates, such as pumice, may also be trending upwards. An increase in the use of natural pozzolans and lightweight aggregates is expected, at least in part, as a consequence of ratification of the Kyoto Protocol. The use of natural pozzolans and fly ash reduces energy consumption and greenhouse gas emissions. Niche markets will continue to provide opportunities for smaller scale operators.

Gypsum

Westroc Inc is forecasting production of 475 000 tonnes of gypsum in 2002 from its **Elkhorn** quarries near Windermere. During the last three years, the company drilled 98 holes, which indicated a resource of 16.7 million tonnes of gypsum on its **Koot** property, northeast of Canal Flats. This year Westroc completed a successful drilling program on its Elkhorn West gypsum deposit, located immediately west of the Elkhorn quarry site. It consisted of 66 drillholes totaling 3656 metres. New reserves at Elkhorn West will postpone the need for development of the Koot deposit. Georgia Pacific Canada Inc will produce an estimated 175 000 tonnes of gypsum from its **Four J** quarry near Canal Flats, to be shipped it to its wallboard plant near Edmonton, Alberta. Both Westroc and Georgia Pacific operate wallboard plants in the Vancouver area. Lafarge Canada Inc mined about 6000 tonnes of gypsum from its **Falkland pit** for its Kamloops cement plant, supplemented by gypsum from Westroc.

Magnesite

Baymag Mines Company Ltd produces magnesite at **Mount Brussilof** at a rate of about 200 000 tonnes annually. The company has two plants in Exshaw, Alberta. The first plant is a converted limekiln producing sintered magnesia; the second houses a 50 000-tonne capacity, multiple hearth furnace, vertical-kiln, dedicated to specialty calcined MgO and also an electrofusing installation. Calcined magnesia is the main product; however, a portion of production is further processed to high-quality fused magnesia for export. The company has also started to sell crushed white magnesite for landscaping applications. Baymag conducted a very modest drilling program in 2002.

Silica

In 2002, Highwood Resources Ltd expects to ship approximately 80 000 tonnes of silica from its **Moberly** mine, mainly to Lavington, British Columbia. In the past, it has also shipped lump silica to Springfield, Oregon, and other destinations; however, since the collapse of American silicon and ferrosilicon production, these shipments have stopped. The **Horse Creek** silica mine, owned by Silicon Metaltech of Seattle and previously operated by Nugget Contracting Ltd, remained idle in 2002 as a result of the 1998 shutdown of the Wenatchee metallurgical grade silicon and ferrosilicon plant. During 2002, Monteith Bay Resources Ltd supplied 30 500 tonnes of geyserite (silica) to the Lehigh Northwest Cement Limited (formerly Tilbury Cement Ltd) plant in Delta, from the quarry at **Monteith Bay** on western Vancouver Island. Lafarge Canada Inc mined about 5000 tonnes of silica-alumina material from the **Buse Lake** deposit, as feedstock for its Kamloops cement plant. Electra Gold Ltd and Homegold Resources Ltd completed a small diamond-drilling program and metallurgical testing in late 2002, at their **Apple Bay** project near Port Hardy. Ash Grove Cement Corporation has entered into an agreement to fund development of the chalky geyserite (silica) deposits on the Apple Bay project.

Limestone

The largest limestone production centre in the province is **Texada Island**, where two quarries, **Gillies Bay** (Texada Quarrying Ltd) and **Blubber Bay** (Ashgrove Cement Corporation), traditionally ship 5 to 6 million tonnes annually to customers in British Columbia, Washington, Oregon and California for cement, chemical and more recently, agricultural use. In 2002, 5.1 and 3.8 million tonnes of rock were quarried from Gillies Bay and Blubber Bay respectively, but not all was shipped. Texada Quarrying Ltd recently invested $10 million in an aggregate crushing plant and shipped crushed rock as far as Los Angeles and San Diego, California. Ashgrove upgraded its crushing plant in 2002 and is expected to ship over 2.4 million tonnes of rock, while Texada Quarrying is expected to ship about 4.2 million tonnes. Both operations currently have excess capacity and are aggressively marketing in Vancouver and the USA.

In addition to pulp mills, which normally produce lime internally, three cement plants and two lime plants in British Columbia process limestone. Graymont Western Canada Inc's **Pavilion Lake** limestone quarry and lime plant, near Cache Creek, has a production capacity of about 190 000 tonnes of lime annually. The **Harper Ranch** quarry of Lafarge Canada Inc is forecast to mine about 187 000 tonnes of limestone, with the associated Kamloops cement plant expected to produce about 122 000 tonnes of cement. Lafarge's Richmond plant and Lehigh Northwest Cement Limited's plants in Delta are state-of-the-art operations. Lafarge's plant has the capacity to produce one million tonnes of cement annually. Pacific Lime Products Ltd at **Giscome**, near Prince George,

sells small quantities of limestone to pulp mills in the region.

I.G. Machine and Fibers Ltd and Homegold Resources Ltd completed a 5000-tonne bulk sampling program in 2002 on their **South Slesse** quarry, near Chilliwack. Graymont Western Canada Inc may submit its proposed 250 000-tonne-per-year chemical limestone **Var** quarry, on Rupert Inlet near Port Hardy, into the Environmental Assessment Process. Clearview Mineral Resources Corp and Tri-Sil Minerals Inc completed a small drilling program on their **Mineral Hill** (Sechelt) limestone property and have proposed a $400 000 bulk sampling and test processing program to confirm a high quality limestone resource.

White Calcium Carbonate

White, high-calcium carbonate is produced at Texada Quarrying Ltd's **Gillies Bay** quarry on Texada Island, at IMASCO Minerals Ltd's **Benson Lake** quarry on Vancouver Island, and, if needed, at **Lost Creek** near Salmo. It has a variety of uses including paper, paint and plastic filler.

Dolomite

Dolomite is quarried by IMASCO Minerals Ltd at its **Crawford Bay** mine on Kootenay Lake and by Mighty White Dolomite Ltd near **Rock Creek**. Dolomite is used for soil conditioning, white ornamental aggregate, stucco and roofing, fine aggregate and in synthetic marble products.

Crushed Stone and Aggregate

Grassroots exploration for traditional construction materials is expanding along the British Columbia coastline. It is expected that shipments of crushed stone from **Texada Island** and other coastal sources will make significant inroads into the Vancouver, Seattle, San Diego, San Francisco and Los Angeles markets. Texada Island limestone producers have already started to exploit this market opportunity (see under Limestone). Texada Island producers are well established, and crushed rock is the natural by-product of their limestone operations. Natural aggregate is the focus of similar market demands. Tilbury Cement Ltd shipped aggregate from its facility at **Sechelt** to the San Francisco Bay area in 2002. Although Polaris Minerals Corporation abandoned its efforts to develop aggregate and crushed rock operations in Bella Coola, it is in the permitting process for a combined crushed rock/natural aggregate operation at **Port Alberni. Polaris** formed a unique partnership with two First Nations groups to form Eagle Rock Minerals Ltd They plan to open quarry adjacent to **Alberni Inlet**, and ship crushed rock to California, where construction industry demand is high. Other companies, including Southern Pacific Development Corp's **Hemm** project near Port Renfrew on southwestern Vancouver Island, propose similar ventures.

Railroad ballast stockpiles, produced last year from Canadian Pacific Railway's **Giscome** basalt quarry and from British Columbia Railway's **Ahbau** basalt quarry, diminished. There was no new production at either quarry. Canadian National Railways, however, also operated at least six other railroad ballast operations in British Columbia: **McAbee** (near Ashcroft), **Boulder** (near Clearwater), **Taverne** (near Tete-Jaune), **Pacific** (east of Terrace) and **Kwinitsa** (Mile 40 on the Skeena River). Canadian Pacific Railway mined, crushed and shipped railroad ballast at its **Swansea Ridge** gabbro quarry south of Cranbrook. No information is available about its **Wallachin** quarry. **Teko** pit, southwest of Taylor near Fort St. John, was a major aggregate crushing operation in 2001 and was reactivated late in 2002. This pit supplies road construction material, mainly for the oil and gas sector in northeastern BC.

Roofing Granules

In October 2001, IG Machine and Fibers Ltd, a subsidiary of IKO Industries Ltd, opened its **Ashcroft** basalt quarry and roofing-granule plant. The plant currently produces at about 50% of its rated capacity of 500 000 tonnes of granules per year in six distinct colours. Basalt is quarried, crushed, sized and coloured on site, prior to shipping to IKO Industries shingle plants in Sumas, Washington, Calgary, Alberta, Winnipeg, Manitoba and Chicago, Illinois.

Industrial Clay and Shale/Sandstone

Clayburn Industries Ltd of Abbotsford processes fireclay from **Sumas Mountain** into a variety of refractory bricks and castable products, which are exported worldwide. Sumas Clay Products Ltd also produces small quantities of flueline pipe and ornamental and facing bricks near Abbotsford. Clayburn, Lafarge Canada Inc and Tilbury Cement Ltd are scheduled to produce around 500 000 tonnes of shale and sandstone from their **Sumas** shale quarry in 2002. Clayburn is developing a new lightweight aggregate with good isolation properties based on this material.

Medical Clays

Ironwood Clay Company Inc is the largest producer of cosmetic/medical clay in British Columbia. It mines seasonally from the **De Cosmos Lagoon** quarry on Hunter Island, west of Bella Coola. Similar material from at least one other BC locality, **Carrie Cove** clay in the Comox Valley, also reached the market. It is currently sold by Carrie Cove Cosmetics for medicinal and cosmetic applications. It is also expected that Glacial Marine Clay Inc will be producing a clay for specialized hydroponics applications. Mr. Robert Davie has an undeveloped clay deposit on **King Island**, west of Bell Coola. The market for cosmetic/medical clay is limited; however, the processed product may retail for about $100/kg. The market for specialized hydroponics clays is less stringent and larger, and the material retails at prices around $20/kg.

Diatomite, Zeolite and Bentonite

Western Industrial Clay Products Ltd produces domestic and industrial absorbents, principally from its **Red Lake** fuller's earth deposit near Kamloops. In the Princeton area, the company also controls the **Bee** and **Brom** zeolite properties and is mining bentonite from the **Bud** property. In 2001 the company began to market leonardite (low-grade oxidized coal) as an organic soil conditioner; however, this division of the company may be closed by the end of 2002. The company secured a contract to sell humic acid (a leonardite derivative) to a major retail chain. The leonardite occurs between the diatomite horizons at Red Lake. There are a number of known bentonite deposits in British Columbia; Willy Kovacevic in the Clinton area made a promising discovery recently.

Highwood Resources Ltd reports increasing annual sales of zeolite from the **Ranchlands Z-1** quarry near Cache Creek. A small amount of mining was done in 2002. **C2C** Zeolite Mining Corporation recently sold its **Z-2** zeolite quarry near Cache Creek and its Ashcroft processing and packaging plant to Industrial Mineral Processors of Calgary, Alberta. C2C Zeolite and Zeo Tech Enviro Corp have created an alliance for processing, product and technology development, and marketing production from respective zeolite deposits in the Cache Creek and Princeton areas, respectively. Zeo-Tech prepared an application for a 75 000-tonne-per-year quarry on its **Zeo** property at Princeton. The site was stripped and drilled, and an initial 4000 tonnes were mined. Near year-end, the company was arranging transport and processing to satisfy a demand for 2500 tonnes. Canmark International Resources Inc is trying to develop a market in the Lower Mainland for zeolite from its **Sunday Creek** deposit near Princeton, but the mine remained inactive.

New zeolite occurrences near **Manual Creek** in the Keremeos area were discovered by Neil Church, under the auspices of the Ministry of Energy and Mines' 2001 Prospectors Assistance Program. The x-ray diffraction results and the cation exchange capacity of grab samples are promising.

Dimension Stone

Westcoast Granite Manufacturing Inc in Delta, Margranite Industries in Surrey, Matrix Marble Corporation in Duncan and Garibaldi Granite Group Inc in Squamish operate stone-processing plants. Margranite processes imported granite, and nine granite varieties, from at least three quarries located in the **East Anderson River**, **Beaverdell** and **Skagit Valley** areas. Garibaldi Granite owns a processing plant in **Squamish** and is mining and processing three granite varieties from nearby quarries. The company also produces a variety of basalt landscape products. Huckleberry Stone Supply Ltd of Burnaby and Mountain High Properties Ltd of Pemberton produced basalt from small quarries in the **Whistler** area. Mountain High recently installed a hydra-splitter at its **Pemberton** factory. In 2001, Matrix Marble Ltd concentrated on processing materials at its plant near Duncan; during 2002, it also extracted blue and white marble from its **Tahsis** quarry on Tlupana Bay, Western Vancouver Island.

Hardy Island Granite Quarries Ltd extracted about 3500 tonnes of stone from its Sechelt area quarry this year and the product was sold through Bedrock Granite Sales in Coquitlam, BC. In 2001,Quadra Stone Ltd produced a small tonnage of Cascade Coral blocks from a new granite quarry near **Beaverdell** no information is available for 2002. Near Kelowna, the Kettle Valley Stone Company produced flagstone, ashlar, thin veneer and landscape rock products from several quarries, the most popular being dacite ash (Mountain Ash) from its **Nipple Mountain** quarry. Revelstoke Flagstone Quarries, Kootenay Stone Centre, and other small operators in the West Kootenays quarried flagstone. Small flagstone quarries were also opened in the North Thompson and Golden areas. Rocky Mountain Slate opened a new slate quarry east of Golden. The blue-grey and beige materials from this location are used as flagstone. Rocky Mountain Tufa produced around 2500 tonnes of tufa, mainly for landscaping applications.

Jade

Jade West Resources Ltd and its affiliated company, Polar Gemstones Ltd, are the main nephrite producers. In 2001 they produced about 200 tonnes of nephrite from the **Kutcho Creek** and **Serpentine Lake** areas, in northwestern BC. There was no activity in 2002; however, the companies expect to be active in mid-2003. Jade West also operates a jade processing facility in south Surrey. The company is currently looking for partners to set up a facility to produce nephrite tiles. Jedway Enterprises Limited extracted small quantities of nephrite from its **Kutcho Creek, Cassiar** and **Polar** sites in the northwest.

Pumice, Tephra and Lava Rock

Canada Pumice Corporation produced about 30 000 cubic metres of tephra from its **Nazko** quarry, west of Quesnel. The material is used for landscaping, sporting facilities, growing and filtration media, and lightweight aggregate applications. Shipments have gone by rail as far east as Toronto, and the company is continuing to develop new markets. Great Pacific Pumice Ltd is shipping a variety of pumice-based products from its **Pum** property on Mount Meager, north of Pemberton. Production in 2001 was estimated at 12 000 cubic metres. In 2002, Garibaldi Aggregates Ltd started to produce pumice from the same area as Great Pacific Pumice Ltd. Mr George Wollanski staked a property in the Falkland area, which may produce three colored varieties of vesicular basalt, potentially to be marketed as a lava rock for landscaping.

Mineral Wool

New investments in plant improvements are expected at an insulation/mineral wool manufacturing plant in **Grand Forks** operated by Roxul (West) International Inc Since 1999 it has invested $25 million in the project, while in 2002 it spent about $4 million to improve its

competitiveness and on environmental initiatives. The main source of rock for the plant is the **Winner** diorite quarry in the Greenwood mining camp, 4 kilometres south of the former Phoenix mine. In 2002, approximately 50 000 tonnes of diorite were mined and crushed there. The material from the Winner quarry is supplemented by talus material from Cannon Creek.

Slag

Pacific Abrasives & Supply Inc is producing and processing slag from **Grand Forks** dumps, mainly for sandblasting at major shipyards and for roofing granules. Some slag was also shipped from **Anyox** by Tru-Grit as abrasives for use in the cement industry, mainly in the Vancouver area, for roofing granules and some other abrasives applications. Teck Cominco Limited is also a major slag producer at its **Trail smelter**. It markets its products mainly for cement production and abrasive applications. The company is converting one of the old furnaces into a second fuming furnace. The use of two furnaces doubles the fuming time and results in substantially lower base metal levels in the slag, improving the quality of the product. For the last few years, slag has also been recovered in the **Greenwood** area and is used as one of the raw materials for the production of mineral wool by Roxul (West) International Inc in Grand Forks; however, in 2002 Roxul was supplied with slag from Grand Forks.

Magnetite

M-Seven Industries Inc produces between 60 000 and 70 000 tonnes of magnetite annually for industrial applications, by processing the **Craigmont** tailings. The company is supplying most coalmines in western Canada with heavy media material for their wash plants. Homegold Resources Ltd optioned its **Iron Ross** magnetite occurrence, approximately 6 kilometres south of Sayward, to Hillsborough Resources Ltd Benson Magnetics Ltd is investigating the feasibility of installing a 25 000 tonne-per year plant near Benson Lake, on northern Vancouver Island.

Graphite

In 2002, Crystal Graphite Corp released new resource calculations for its **Black Crystal** graphite deposit in the Slocan Valley. The weathered zone is estimated to contain 648 000 tonnes grading 1.82% fixed carbon in measured and indicated resources, and 516 000 tonnes of inferred resources grading 1.69% fixed carbon. The underlying unweathered zone has indicated resources of 4 763 000 tonnes grading 1.21% fixed carbon, and 4 591 000 tonnes of inferred resources grading 1.24% fixed carbon. The company also received a mining permit to process flake graphite to a maximum feed rate of 250 000 tonnes-per-year. Some metallurgical work was also performed.

Sulphur

West Coast Energy Inc, Petro-Canada Inc, TransCanada Midstream and Amoco Canada Petroleum Company Limited produce sulphur, a byproduct of natural gas, at a number of processing plants in the northeast of the province. Liquefied SO_2 and sulphuric acid are also produced at Cominco's smelter in Trail. No data are available for 2002; however, for 2001 the production was 904 000 tonnes.

High Tech Minerals

Commerce Resources Corporation drilled its **Fir** carbonatite deposit near Blue River in 2002 in order to increase the existing resource of 5.2 million tonnes grading 194 g/t Ta_2O_5, 897 g/t Nb_2O_5 and 3.5% P_2O_5. Its 2001 resource estimate for the nearby **Verity** deposit was 3.06 million tonnes grading 196g/t Ta_2O_5, 646 g/t Nb_2O_5, and 3.2% P_2O_5. The flat-lying, Fir ferrocolumbite and pyrochlore-bearing carbonatite, with an average thickness of 40 metres, has been outlined over an area 425 by 325 metres. The company also conducted metallurgical work on the Fir mineralization and recently announced completion of two preliminary cost assessments on the processing and beneficiation of these two tantalum and niobium-enriched carbonatites. No work was done on Cross Lake Minerals Ltd's **Myoff Creek** niobium, tantalum and rare earths property in 2002.

Gemstones

In 2001, Skeena Resources Limited drilled five holes to test the RAM 5 and RAM 6 kimberlite pipes on its **Ice** kimberlite property near Elkford. Diamonds were reported previously from surface samples and one hole on the RAM 6 site is reported to have intersected 105 metres of kimberlite. In addition, a 4-tonne bulk sample was collected from surface on the nearby **Bonus** kimberlite pipe. Caustic fusion dissolution and analysis of the kimberlite core samples failed to detect microdiamonds, and dense media separation of the 4-tonne bulk sample also failed to detect diamonds. A number of untested geophysical and indicator mineral anomalies remain on the property, and the RAM 5 and Bonus pipes have had limited and no drill testing, respectively. In 2001, Pacific Ridge Exploration Limited conducted a modest chip-sampling program on the RAR 3, RAR 5 and RAR 7 zones of its tantalum and rare earth element-bearing **Xeno** property, 140 kilometres east of Dease Lake. A 10-kilogram sample was also collected from a diatreme breccia for diamond indicator mineral processing. The 2002 results reported the recovery of one microdiamond.

Okanagan Opal Inc continues to cut, test and market precious opal from the **Klinker** locality near Vernon. Follow-up prospecting and excavating was conducted on the **Northern Lights** precious opal occurrence in the Whitesail Range, south of Houston in 2001. This year there was no new mining; however, a small quantity of opal was retrieved from the material mined the previous year. Mr Schaefer of Burns Lake discovered precious opal bearing boulders, or subcrop, in 1999, on the **Firestorm** property west of Burns Lake. In 2001, Cantec Ventures Inc excavated trenches to bedrock, and washed a 20 cubic

metre bulk sample to recover opal and opalized basalt. Most of the trenches were rehabilitated in 2002. The Schaefer family continues to extract precious opal by hand.

Barite

Tiger Ridge Resources Ltd continued underground development and bulk sampling, 1000 tonnes, on its barite project in two adits at **Jubilee Mountain**, west of Spillimacheen. In addition, underground drilling surface exploration drilling northwest of the adits continued in 2002. The barite potential of the adjacent past-producing Silver Giant Mine was also investigated.

In 2001, Fireside Minerals Inc mined 15 000 tonnes of barite from the Bear vein at the **Fireside** mine, 125 kilometres east of Watson Lake, and used jigs to recover 10 000 tonnes of barite for the northwest British Columbia and Alberta oil and gas drilling industry. In 2002, Fireside shipped only 1500 tonnes.

Wollastonite/Garnet

During February 2002, Clearview Mineral Resources Corp and Tri-Sil Minerals Ltd completed a six-hole, 1000-metre diamond-drilling program on their **Mineral Hill** wollastonite/garnet skarn project, near Sechelt. Skarn is intermittently exposed on surface over a strike length of 4.5 kilometres. Drilling helped confirm the depth continuity of skarn mineralization that is exposed on surface between the Mine and Skidder zones along a 400-metre strike length. One hole intersected 66.48 metres grading 50% wollastonite and 50% garnet.

Perlite

During late 2002, BBF Resources Ltd announced plans to truck approximately 400 tonnes of stockpiled perlite from its **Frenier** deposit, southwest of Williams Lake, to a processing plant in Ashcroft. There, the material will be crushed, dried and screened to produce commercial-sized product samples for horticultural customers in Canada. BBF is also working on a geological and resource study and hopes to begin mining new ore next spring.

GOVERNMENT INITIATIVES

During 2002, the Government of British Columbia continued a number of measures to assist mineral resource planning, exploration and development, including:

- The *British Columbia Mining Exploration Tax Credit Program* continued in its fourth year. It provides for a 20% refundable credit of qualified expenses not funded by flow-through shares. This is in addition to the 15% federal tax credit and the existing 100% deduction of Canadian Exploration Expense, equivalent to 139% tax reduction. In 2002, British Columbia had the second most attractive mineral tax incentive program in Canada.
- The Federal government's introduction of flow-through shares was strongly supported by the Provincial government to assist with the opening up of the province's mineral resources.
- In 2002 the Ministry of Energy and Mines initiated a private-public partnership program (P3) for geoscience surveys. This program formalized more than 100 years of informal field assistance from industry. P3s were an integral component of many of the mineral geoscience field projects (Figure 11). All results of P3s are published to benefit all those who wish to prospect and explore in the province.

Figure 11 ...

- The Province continued to examine the economic and social viability of a road link between the mineral-rich Toodoggone area, including the Kemess mine, and the deep-water port at Stewart.
- The Ministry of Energy and Mines carried out a mineral geoscience field program, including three major projects with the Geological Survey of Canada in the **Bella Coola, Fraser Lake** and **Atlin** areas of the province. Much of British Columbia's extensive geoscience information is available on the Ministry's website at www.em.gov.bc.ca/geology.
- As part of the **Atlin Targeted Geoscience Initiative project**, a Ministry of Energy and Mines geologist discovered a new massive sulphide showing called the Joss'alun (Fig 9). A mini-staking rush occurred when the field and assay results were released in mid-September.
- In partnership with the Geological Survey of Canada, a **Regional Geochemical Survey** (RGS) was completed in the northwestern portion of the **Fort Fraser** (NTS 93K) area. Results will be released in mid-2003.
- RGS results from the **Bella Coola** and **Laredo Sound** areas (NTS 93D and 103A) and **Triumph Bay** (parts of NTS 103H) were released. Archived samples from previous RGS surveys covering the **Prince George** (NTS 93G) and **McBride** (NTS 93H) map sheets were analyzed for additional elements, including gold and tungsten, and the data published.
- Over the past year the Ministry of Energy and Mines published 2 new bulletins, 16 Open Files including new Ecstall maps, 4 new Geoscience Maps, Geological Fieldwork, Exploration and Mining in BC 2001, 2 Regional Geochemistry Survey data releases, 7 GeoFiles and other brochures and products.
- A complete library of Ministry of Mines Annual Reports and issues of Geological Fieldwork have been posted to the Ministry website for free access.
- Ministry of Energy and Mines staff played key roles in organizing and speaking at mineral industry conferences.
- After more than 10 years, the British Columbia Institute of Technology and British Columbia Chamber of Mines with the support of the Ministry of Energy and Mines revived the well-known prospector field school. Twenty students participated in the course, which was based in the Oliver region.
- **MapPlace, MINFILE** and the **Assessment Report** databases continue to be upgraded and made more easily accessible to clients on the Ministry website: www.em.gov.bc.ca/geology

Government Initiatives

- **Exploration Investment Tax Credit**
- **Flow-Through Shares**
- **Regional Geochemical Survey results released for Bella Coola and North Coast areas**
- **Major geoscience database additions and revisions**
- **Numerous new publications**

Exploration Outlook for 2003

The harmonized federal *Exploration Investment Tax Credit* for flow-through share investors in new British Columbia projects, coupled with the *British Columbia Mining Exploration Tax Credit*, will be key elements in an anticipated increase in mineral exploration financing in 2003.

Positive trends in exploration expenditures and mineral statistics, successes at advanced exploration projects, and the number of new discoveries recorded in 2002 all bode well for a much more vibrant exploration season in 2003. Exploration companies and individuals have acquired ground in British Columbia with this upturn in mind, and in some cases, work programs have already been approved and financed for 2003. For example, Noranda Inc picked up the **Kerr - Sulpherets** projects and Kinross Gold Corporation entered into joint ventures on the **Kena** (Sultan Minerals Ltd) and **Sib** (Heritage Explorations) projects.

As in 2002, gold is expected to be the main exploration target, followed by copper. The **Eskay Creek** mine with its total resource of 7.3 million ounces of 'gold equivalent' continues to attract province-wide attention. This is particularly so in the northwest, where the potential for stratabound, precious metal-enriched, subaqueous hot-spring deposits is good. Several grassroots exploration programs and claim acquisitions which were carried out in the Iskut River area in 2002 are expected to receive funding in 2003 and generate numerous significant programs.

The gold±copper porphyry and intrusion-related targets will continue to be a focus of exploration throughout the province. Property consolidations in many of British Columbia's past producing camps (*e.g.* Bralorne, Greenwood, Rossland and Wells-Barkerville), based on relatively high gold prices, will receive increased work in 2003.

The Wolverine (Perry Creek and Mt. Spieker), Burnt River (Brazion) and Basin new coal developments are advancing to production, perhaps as early as 2003 or 2004.

A significant increase in coalbed methane exploration and development is expected to continue.

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Internet access to BC Ministry of Energy and Mines information

Resource Development Division
www.em.gov.bc.ca/Mining/

BC Geological Survey Branch
www.em.gov.bc.ca/Mining/Geolsurv/

Mineral Titles
www.em.gov.bc.ca/Mining/Titles/

MapPlace
www.em.gov.bc.ca/Mining/Geolsurv/MapPlace/

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